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BIOCHAR AND TRICHOKOMPOS ORGANIC FERTILIZERS IMPROVE SOIL CHEMISTRY QUALITY AND LETTUCE VEGETABLE PRODUCTION

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ABSTRACT

Soil quality becomes poor with the use of inorganic chemical fertilizers and pesticides. Some efforts have been made to improve the quality of the soil, but naturally, not much has been studied. Natural improvement of soil quality by using Trichoderma and biochar and applying them to the cultivation of lettuce vegetables has not been reviewed, so it needs to be studied. This research aims to improve soil quality with Trichoderma and biochar and trial it on the cultivation of lettuce vegetable plants. The study was conducted by analyzing the chemical properties of the soil two weeks before being planted with lettuce. At the time of planting with lettuce is fertilized with Trichoderma and biochar, at the planting age of 2 weeks after planting, then the planting age after three weeks analyzed the quality of the soil again. To study the cultivation of lettuce, measurements of leaf length, plant height, Number of leaves, and plant weight at the time of harvest. The results showed an improvement in soil quality, from a soil pH of 5.5 to a pH of 7.0 N levels; 0.16%, K exchange;3.9 and P available; 4.3 ppm is better. Lettuce plants grown in soil treated with Trichoderma and biochar fertilizers showed greater yields than lettuce plants not treated with Trichoderma and biochar fertilizers. This research could improve soil quality for the foreseeable future using Trichoderma and biochar fertilizers.

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A B S T R A K

Kualitas tanah menjadi buruk dengan pemakaian pupuk kimia anorganik dan pestisida. Beberapa usaha sudah dilakukan untuk memperbaiki kualitas tanah, tapi secara alami belum banyak dipelajari. Perbaikan kualitas tanah secara alami dengan menggunakan trichoderma dan biochar serta mengaplikasikannya pada budidaya sayuran selada belum diteliti, sehingga perlu dipelajari. Penelitian ini bertujuan meningkatkan kualitas tanah dengan trichoderma dan biochar, serta mengujicobakannya pada budidaya tanaman sayuran selada. Penelitian ini dilakukan dengan menganalisa sifat kimia tanah 2 minggu sebelum ditanami dengan selada. Pada saat ditanami dengan selada diberi pemupukan dengan trichoderma dan biochar, pada umur tanam 2 minggu setelah tanam, kemudian umur tanam setelah 3 minggu, dianalisa lagi kualitas tanahnya. Untuk mempelajari budidaya seladanya maka dilakukan pengukuran panjang daun, tinggi tanaman, jumlah daun, dan berat tanaman pada saat panen. Hasil penelitian menunjukkan terjadi peningkatan kualitas tanah, dari pH tanah 5,5 menjadi pH 7,0 kadar N; 0,16%, K tukar ;3.9 dan P tersedia; 4,3 ppm menjadi, lebih baik. Tanaman selada yang ditanam pada tanah yang diperlakukan dengan pupuk trichoderma dan biochar menunjukkan hasil yang lebih besar daripada tanaman selada yang tidak diperlakukan dengan pupuk trichorderma dan biochar. Penelitian ini dapat berkontribusi pada perbaikan kualitas tanah untuk masa yang akan datang, dengan pemakaian pupuk trichodrema dan biochar.

INTRODUCTION

Type of soil inceptisol is soil whose chemical properties are not good. (Sudirja et al., 2017), (Sultana et al., 2021). For plant growth in general, the chemical properties of pH are acidic from 4.5 - 6.5, and the content of N, P, and K is low, too low, and the organic C content. This type of soil, when planted, usually must be improved soil fertility first, one of which is with Biochar (Pandit et al., 2018) for their fertilization. The biochar used is (0.5% and 2% w:w), and its biochar is made from a mixture of invasive shrubs with the weed Eupatorium adenophorum using a fire curtain kiln.

Improvement of soil chemical properties using chemical fertilizers is not good, will only worsen the chemical properties of the soil. That's why the repair is done using Trichokompos, which consists of all organic ingredients when composting added mushrooms or mushroom antagonist Trichoderma sp (BPTP Jambi, 2019). Improvements in soil chemical properties can also be made with biochar because raw materials for biochar manufacturing are available a lot, such as coconut shells which is one of the solid wastes of Virgin Coconut Oil (Suryani, Dharma A, Manjang Y, Arief S, 2016; Suryani, 2020, 2016, 2021; Suryani et al., 2017, 2018, 2020).

Biochar is used to increase the ability to absorb water by soil to increase soil moisture and soil pH.(Ahmad et al., 2018; Lonappan et al., 2018; Shen et al., 2019). Biochar can also reduce the absorption of metals such as Al, Zn, Cu(II), Cd(II), and Pb(II). (Ahmad et al., 2018), (J. J. Zhao et al., 2019).

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Biochar also depends on the materials used for its manufacture, such as biochars from urban solid waste mixed with pig manure. (Lonappan et al., 2018), a mixture of shrubs with weeds burned using kilns (Pandit et al., 2018). There is also biochar made from a mix of chicken manure, sapid dung, and cane waste by adding inoculum Trichoderma viride (Lonappan et al., 2018). In the pyrolysis process, a mixture of rice husks and waste corn weevils has been made into biochar in India (Mohan et al., 2018). Meanwhile, biochar can also be made from agricultural waste, wood waste, and sludge pyrolysis. (J. J. Zhao et al., 2019). Biochar, in addition to raising the pH of the soil, can also reduce the heavy metals absorbed by plants because Al is negligible so that Cu(II), Zn(II), and Pb(II) can be blocked by absorption by plants. In addition, biochar can also help the absorption of water by plants. (Danish & Zafar-ul-Hye, 2019; Gao et al., 2019; N. Zhao et al., 2018).

In Taiwan (Tsai & Chang, 2019), it has been studied, that to improve soil fertility used biochar and compost mixtures on several variations of addition. In addition, wine or fermented ingredients that contain microbes are also added. The function of biochar is to multiply the food stock of plants, and can block the absorption of heavy metals by. Absorption of heavy metals will be harmful to plants (Wan et al., 2019), (Lonappan et al., 2018), (Premarathna et al., 2019)(Premarathna et al., 2019) with biochar will help humans.

To improve the chemical properties of the soil, it can also be used Trichoderma fertilizer. (Medeiros et al., 2020), in this case, what is used is mushrooms. *Trichoderma*. With Trichoderma, this will increase soil improvement. In addition to increasing soil pH, which increases soil moisture, it can also increase urease enzymes, β-glucosidase, and total organic carbon. Some organic Trichoderma fertilizers have been studied, including combining Trichoderma with compost.(Nuraini & Aqila, 2020), It was tested on corn crops, and it was proven that there was an increase in corn crop production and improvements in the chemical properties of the soil. It has also been studied to improve the chemical properties of soil by using trichocompos for onion cultivation in peat soil. (Dan et al., 2021) , it turns out that improving the chemical properties of the soil also improves its physical and biological properties.

Trichoderma in compost can kill bacteria or pathogenic fungi that interfere with corn growth. The use of Trichocompos also plays a role in increasing water absorption and increasing N and P residues in plant growth.(Nuraini & Aqila, 2020). Because Trichokompos is a compost enriched with the antagonist fungus Trichoderma harsianum, which accelerates the reliever that is a decomposer and controls pathogens that cause soil tular disease. Of the several studies that have been put forward and have been studied, no one has studied the merger of biochar with trichocompos to improve the chemical properties of soil. For that, research is needed to be done on the use of biochar and trichokompos to improve the nature of the soil and cultivate it with the cultivation of lettuce vegetables. So the study was conducted to use biochar and trichokompos to improve the chemical properties of the soil and its testing with the cultivation of lettuce vegetables. Contributing to society, soils such as the inceptisol type can be utilized to the maximum by improving their chemical, biological and physical conditions by using biochar and trichokompos.

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METHODS

Samples

Biochar and Trichokompos, as ingredients to improve the chemical properties of soil Lettuce vegetables as a plant to test Biochar and Trichokompos Soil inceptisol on the experimental garden land of the Faculty of Agriculture, University of Muhammadiyah West Sumatra used as a place to cultivate lettuce vegetables. And the soil repaired the chemical properties of its soil.

Instrument

Used in addition to glass tools such as Erlenmeyer, test tubes and cup glasses, are used in the LLDIKTI X Chemistry Laboratory for soil testing, such as pH meters to measure soil pH, ovens for drying soil, simple distillation tools, and Kjeldahl tools for N testing, tools for measuring Phosphor and Potassium with Bray I methods, and organic C by the Walkley and Black Method method. Also, agricultural implements for cultivating lettuce vegetables include hoes, shovels, labels, signs, scales, plastics, and wares.

Methods

Carried out in this study there are 2, namely,

1. Laboratory methods for analyzing soil before planting with lettuce vegetables.

a. 2 Weeks before planting, samples of inceptisol soil where the land planting lettuce vegetables are analyzed for the chemical properties of the soil, namely the content of N, P, and K. With the sample taken randomly at 5 points, on all four sides, and in the middle, with a depth of 0 to 40 cm. Each sample was taken two times, so there were ten samples.

b. one week after the second biochar and Trichokompos administration (age three weeks after planting), meaning one month after planting, soil samples are retaken randomly around the rooting of lettuce vegetables at five points and twice sampling also at a depth of 0-40 cm. The dose of Biochar and Triopos (1:1 mixture) is

   - 0 gr/plant (0 kg/ha) control
   - 3.6 gr/ plant (400 Kg/Ha)
   - 5.4 gr/plant (600 Kg/Ha
   - 6.3 gr/plant (700Kg/Ha)

   Its biochar is made with the basic material of coconut shells that are burned in holes in the ground and covered on its surface.

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Trichokompos is made with municipal garbage compost added Trichoderma and fermented for 2 weeks.

2. See the growth of lettuce vegetables once a week by deciding

   a. Long leaves,
   b. High plant
   c. Number of leaves
   d. Total weight of lettuce plants after harvest

The statistical analysis uses a Random Plan of Groups with five treatments and five repeats.

RESULTS AND DISCUSSION

Analysis of the chemical properties of early inceptisol soils.

Initial analysis of the chemical properties of inceptisol soil is two weeks before planting lettuce vegetables by random sampling at 5 location points with two picks. The ground is taken with a depth of 0-40 cm. The results of the analysis of the chemical properties of the soil can be seen in Table 1 below,

Table 1 Analysis of the chemical properties of early inceptisol soils

Sample	pH	% N	P available (ppm)	K –dd (me.100g-1)
-0 kg/ha				
A2.1	5.2	0,16	3,9	3.3
A2.2	5.4	0,14	4,3	3.1
average	**5.3**	**0.15**	**4.1**	**3.2**
-400 kg/ha				
A3.1	5.7	0,17	4.3	5.1
A3.2	5.7	0,15	4,5	3.3
average	**5.7**	**0.16**	**4,4**	**4.2**
-600 kg/ha				
A4.1	5.3	0,16	4.4	4.8
A4.2	5.7	0,16	3,8	3.2
average	**5.5**	**0.16**	**4,1**	**4.0**
-700 kg/ha				
A5.1	5.6	0,15	4.4	4.3
A5.2	5.4	0,15	4.6	3.7
average	**5.5**	**0,15**	**4.5**	**4**
Total	**5.5**	**0,16**	**4,3**	**3,9**

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Initial analysis of inceptisol soil in the cultivation of lettuce vegetables is in accordance with research conducted (Sudirja et al., 2017). Its acidic pH is 5.78, its %N and others correspond to the characteristics of the soil inceptisol. Nitrogen is found to be in low quantities, whereas nitrogen is needed once by plants to grow and develop. Nitogens are required in the process of photosynthesis, rooting, tuber formation and others as such. Also for the formation of green leaf substances.

Analyze the chemical properties of inceptisol soil 1 month after planting.

One month after planting or 2 weeks after the administration of biochar and Trichokompos, again analyze the chemical properties of the soil. The soil around the root of each group is randomly selected. In the hope of repairing the land. And it turns out that the result is as in table 2 below

Table 2. Analyze the chemical properties of soil after treatment with biochar and trichodermacompos. (Average of calculations)

Sample	pH	% N	P available (ppm)	K –dd (me.100g-1)
--0 kg/ha average	**5.6**	0.18	4.5	4.2
-400 kg/ha average	6.9	2.32	22.4	9.7
-600 kg/ha average	7.3	2.5	27.5	13.4
-700 kg/ha average	7.4	3.5	45.6	14.9
Total	**7.0**	**2,24**	**26.94**	**13,8**

After one month of planting, pH turned out to rise to 6.94, which happened because of the provision of biochar and Trichokompos. The existence of biochar, which is charcoal, causes the absorption of water to be more excellent, so that with the fact of OH- ions from

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H2O that increase, causing pH also increases so that numbness increases, this is following what is done (Wati & Sholihah, 2021). When the pH is acidic, then the lettuce plant becomes yellow leaves. But after being treated with biochar and Trichokopos, pH becomes alkaline.

N content rose to 2.24% after treatment with biochar and Trichokompos, which is according to what is done by (de la Rosa et al., 2018) (Glaser & Lehr, 2019)(Wang et al., 2020). The rise in N content is because biochar is charcoal that also contains high organic C ingredients, so that with high organic ingredients will cause its N content to be also increased. This is indispensable by lettuce vegetable plants, as a high N is indispensable for photosynthesis, which forms the green substance of the leaves and the production of their vegetables.

Likewise with Pospor, the P content increases due to the addition of biochar and tropchocompos in accordance with the (R. Ayu Chairunnisya, Hamidah Hanum, 2017), where biochar contains high organic C, so P from senyaea organic adds P available. Likewise, with the water-holding properties of biochar, ptersedia does not drift or not decrease, even increases. Potassium elements like that as well.

Growth of lettuce vegetables

To prove whether there is a change in the chemical properties of this inceptisol soil, then the cultivation of lettuce vegetables and seen the development of leaf length, leaf width, height of planting, number of leaves and weight of plants after harvest. The calculation is done with the Acal Group Design statistics, as can be seen in Table 3 below,

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Table 3 The results of the analysis of diversity fingerprints (ANOVA) influence of the provision of biochar and trichokompos fertilizer (1:1) on the growth and production of lettuce plants (Lactuca sativa L)

No.	Observed variables	Effect of treatment
1.	Plant height	
	• 1 MST	**
	• 2 MST	**
	• 3 MHST	**
	• 4 MST	**
2.	Number of leaves (strands)	
	• 1 MST	**
	• 2 MST	**
	• 3 MST	**
	• 4 MST	**
3.	Leaf length (cm)	
	• 1 MST	**
	• 2 MST	**
	• 3 MST	**
	• 4 MST	**
4.	Leaf width (cm)	
	• 1 MST	**
	• 2 MST	**
	• 3 MST	**
	• 4 MST	**
5.	Fresh weight of plants	**

Different is very real.
* It's real different.
tns It's no different for real.

From table 3 it can be seen that the results of the analysis of the variety of biochar and fertilizer Trichokompos with a ratio of 1: 1 gives a very real different influence for the growth of lettuce vegetable plants. This is also in accordance with (Novriani1, Yulhasmir1, 2020),(Samoal et al., 2018), (Musa et al., 2021).

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Figure 1 Cultivated lettuce plants

Table 4 Effect of biochar and trichokompos addition treatment (1:1) on plant height

Treatment	The effect of treatment on			
	Plant height (cm)	Number of leaves	Leaf length (cm)	Leaf width (cm)
	1 MST	**1 MST**	**1 MST**	**1 MST**
A0	1,24 a	1,55 a	1,31 a	1,52 a
A1	2,15 a	2,34 a	2,17 a	2,2 a
A2	2,84 a	3,3 a	2,3 a	2,63 a
A3	3,24 b	4,16 b	3,26 b	3,4 b
	2 MST	**2 MST**	**2 MST**	**2 MST**
A0	2,97 a	2,5 a	2,6 a	2,9 a
A1	3,8 a	3,4 a	3,13 a	3,5 a
A2	4,53 a	3,96 a	3,93 a	4,13 a
A3	5,53 b	5,13 b	5,4 b	5,46 b
	3 MST	**3 MST**	**3 MST**	**3 MST**
A0	5,37 a	4,43 a	5,44	4,3 a
A1	6,4 a	5,40 a	6,4 a	5,13 a
A2	7,1 a	6,63 a	7,1 a	6,4 a
A3	7,56 b	7,44 b	7,7 b	7,16 b
	4 MST	**4 MST**	**4 MST**	**4 MST**
A0	8,43 a	8,13 a	8,2 a	7,16 a
A1	9,03 a	8,9 a	9,10 a	7,93 a
A2	9,67 a	9,27 a	9,77 a	9,13 a
A3	10,93 b	10,56 b	10,66 b	10,04 b

From Table 4, it can be seen that there is a noticeable difference after four weeks after planting, his lettuce growth increases. The increase occurs both in the height of the plant, the number of leaves, the width of the leaves, and the length of the leaves. This happens because of the gift of biochar and trichokompos fertilizer with a ratio of 1:1. This biochar increases N, P, and K, while it is a macro element that plants need to stimulate overall growth. N serves to synthesize amino acids and proteins. Element N also affects the green color of lettuce, affecting the length of the leaves and the width of the leaves. Element P in the process of plant metabolism serves to produce energy to stimulate root growth, fertilization, cell division, and encourage flowering. At the same time, element K functions as

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a transporter resulting from photosynthesis. It also acts as an activator on enzymes.(Samoal et al., 2018), (Novriani1, Yulhasmir1, 2020).

Table. 5 Effect of the treatment of addition of biochar and Trichokompos (1:1) on the fresh weight of the plant

Treatment	Fresh weight of plants
A0	2,63a
A1	3,7a
A2	4,63a
A3	5,9b

Conclusion.

From exposure to the results of the study it can be concluded that the use of biochar and trichokompos fertilizer with a ratio of 1: 1 can improve the chemical properties of inceptisol soils that are acidic to be alkaline and suitable for lettuce cultivation. For the cultivation of lettuce there is a difference when the soil is not added biochar and trichokompos fertilizer and when added, increased.

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Reference

Ahmad, Z., Gao, B., Mosa, A., Yu, H., Yin, X., Bashir, A., Ghoveisi, H., & Wang, S. (2018). Removal of Cu(II), Cd(II) and Pb(II) ions from aqueous solutions by biochars derived from potassium-rich biomass. *Journal of Cleaner Production*, *180*(Ii), 437–449. https://doi.org/10.1016/j.jclepro.2018.01.133

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

BPTP Jambi. (2019). *Pemanfaatan trichokompos pada tanaman sayuran*.

Dan, P., Bawang, H., Allium, M., Trichokompos, A., Bawang, G. T., & Sutriana, M. (2021). *Aplikasi Trichokompos Dan Pupuk Grand-K Terhadap*. *12*(1), 1–8.

Danish, S., & Zafar-ul-Hye, M. (2019). Co-application of ACC-deaminase producing PGPR and timber-waste biochar improves pigments formation, growth and yield of wheat under drought stress. *Scientific Reports*, *9*(1), 1–13. https://doi.org/10.1038/s41598-019-42374-9

Gao, L. Y., Deng, J. H., Huang, G. F., Li, K., Cai, K. Z., Liu, Y., & Huang, F. (2019). Relative distribution of Cd2+ adsorption mechanisms on biochars derived from rice straw and sewage sludge. *Bioresource Technology*, *272*, 114–122. https://doi.org/10.1016/j.biortech.2018.09.138

Glaser, B., & Lehr, V. I. (2019). Biochar effects on phosphorus availability in agricultural soils: A meta-analysis. *Scientific Reports*, *9*(1), 1–9. https://doi.org/10.1038/s41598-019-45693-z

Lonappan, L., Rouissi, T., Brar, S. K., Verma, M., & Surampalli, R. Y. (2018). Adsorption of diclofenac onto different biochar microparticles: Dataset – Characterization and dosage of biochar. *Data in Brief*, *16*, 460–465. https://doi.org/10.1016/j.dib.2017.10.041

Medeiros, E. V., Moraes, M. C. H. S., Costa, D. P., Duda, G. P., Silva, J. S. A., Oliveira, J. B., Lima, J. R. S., Menezes, R. S. C., & Hammecker, C. (2020). Biochar and Trichoderma aureoviride applied to the sandy soil: Effect on soil quality and watermelon growth. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, *48*(2), 735–751. https://doi.org/10.15835/nbha48211851

Mohan, D., Abhishek, K., Sarswat, A., Patel, M., Singh, P., & Pittman, C. U. (2018). Biochar production and applications in soil fertility and carbon sequestration-a sustainable solution to crop-residue burning in India. *RSC Advances*, *8*(1), 508–520. https://doi.org/10.1039/c7ra10353k

Musa, N., Pembengo, W., Nurdin, & Akis, N. O. (2021). Pertumbuhan dan Hasil Tanaman Selada (Lactuca sativa L.) dengan Interval Pemberian Air dan Pupuk Majemuk di Tilote, Kabupaten Gorontalo. *Jurnal Agrotek*, *5*(1), 1–8.

Novriani1, Yulhasmir1, H. 1. (2020). RESPON PERTUMBUHAN DAN PRODUKSI TANAMAN SELADA (Lactuca sativa L.) TERHADAP PEMBERIAN PUPUKKANDANG KOTORAN KAMBING YANG DIKOMBINASIKAN DENGAN PUPUK NPKMAJEMUK Novriani1,. *LANSIUM I*, *1*(2), 31–41. http://www.tjyybjb.ac.cn/CN/article/downloadArticleFile.do?attachType=PDF&id=9987

Nuraini, Y., & Aqila, M. (2020). PERAN TRICHOKOMPOS DAN PUPUK NPK 16-16-16 TERHADAP SERAPAN DAN RESIDU HARA N DAN P, SERTA HASIL JAGUNG KETAN (Zea mays ceratina). *Jurnal Tanah Dan Sumberdaya Lahan*, *7*(1), 93–100. https://doi.org/10.21776/ub.jtsl.2020.007.1.12

Pandit, N. R., Mulder, J., Hale, S. E., Martinsen, V., Schmidt, H. P., & Cornelissen, G.

http://doi.org/10.22216/jk.v5i2.5717
Published by LLDIKTI Wilayah X

(2018). Biochar improves maize growth by alleviation of nutrient stress in a moderately acidic low-input Nepalese soil. *Science of the Total Environment*, *625*, 1380–1389. https://doi.org/10.1016/j.scitotenv.2018.01.022

Premarathna, K. S. D., Rajapaksha, A. U., Sarkar, B., Kwon, E. E., Bhatnagar, A., Ok, Y. S., & Vithanage, M. (2019). Biochar-based engineered composites for sorptive decontamination of water: A review. *Chemical Engineering Journal*, *372*, 536–550. https://doi.org/10.1016/j.cej.2019.04.097

R. Ayu Chairunnisya, Hamidah Hanum, B. H. (2017). Aplikasi Bahan Organik dan Biochar untuk Meningkatkan C – Organik, P dan Zn tersedia Pada Tanah Sawah Application. *Jurnal Agroekoteknologi FP USU*, *5*(3), 494–499.

Samoal, A., Botanri, S., Pertanian, F., & Darussalam, U. (2018). Jurnal Agrohut Selada (Lactuca sativa L) setelah aplikasi pupuk kotoran sapi. *Jurnal Agrohu*, *9*(Nazaruddin 2003).

Shen, Z., Hou, D., Jin, F., Shi, J., Fan, X., Tsang, D. C. W., & Alessi, D. S. (2019). Effect of production temperature on lead removal mechanisms by rice straw biochars. *Science of the Total Environment*, *655*, 751–758. https://doi.org/10.1016/j.scitotenv.2018.11.282

Sudirja, R., Joy, B., Yuniarti, A., & Trinurani, E. (2017). Beberapa Sifat Kimia Tanah Inceptisol dan Hasil Kedelai (Glycine max L.) Akibat Pemberian Bahan Amelioran. *Prosiding Seminar Hasil Penelitian Tanaman Aneka Kacang Dan Umbi 2017*, *15*(2), 198–205. http://balitkabi.litbang.pertanian.go.id/wp-content/uploads/2018/07/Prosiding-2017-20-rija.pdf

Sultana, M., Jahiruddin, M., Rafiqul Islam, M., Mazibur Rahman, M., & Anwarul Abedin, M. (2021). Effects of nutrient enriched municipal solid waste compost on soil fertility, crop yield and nutrient content in brinjal. *Eurasian Journal of Soil Science*, *10*(3), 191–198. https://doi.org/10.18393/ejss.880503

Suryani, Dharma A, Manjang Y, Arief S, A. (2016). Isolation and Characterization of Bacteriocins Bacteria Lactobacillus Plantarum Strain NM178-5 from Fermentation Process which Contained on Coconut Milk. *Transylvanian Review*, *XXIV*(6), 614–628.

Suryani. (2020). VCO (Virgin Coconut Oil) Dapat Digunakan Sebagai Obat Membunuh Cocid. *Forum Sumbar*, *XXIV*, 2016–2018.

Suryani, S. (2016). ISOLASI BAKTERI PATTOGEN PADA PASIEN PENDERITA INFEKSI TELINGA Chronic supparative otitis media (OMSK). *Jurnal Katalisator*, *1*(2). https://doi.org/10.22216/jk.v1i2.1005

Suryani, S. (2021). *Rahasia VCO (Virgin Coconut Oil) Dapat Membantu Penyembuhan covid-19 : ditinjau dari perspektif Biokimia :* (Mf. Apt. Verawati (ed.); 1st ed.).

Suryani, S., Nofiandi, D., Mukhtar, H., Siska, M., Dharma, A., & Nasir, N. (2017). IDENTIFIKASI MOLEKULAR BAKTERI ASAM LAKTAT Lactobacillus paracasei YANG ADA PADA LAPISAN MINYAK VCO. *Jurnal Katalisator*, *2*(2), 79. https://doi.org/10.22216/jk.v2i2.2517

Suryani, S., Sariani, S., Earnestly, F., Marganof, M., Rahmawati, R., Sevindrajuta, S., Indra

Mahlia, T. M., & Fudholi, A. (2020). A comparative study of virgin coconut oil, coconut oil and palm oil in terms of their active ingredients. *Processes*, *8*(4), 1–11. https://doi.org/10.3390/PR8040402

Suryani, S., Zulmardi, Dharma, A., & Nasir, N. (2018). Isolation and identification of pathogenic bacteria secretion of chronic suppurative otitis media patients. *Rasayan Journal of Chemistry*, *11*(3), 1139–1143. https://doi.org/10.31788/RJC.2018.1131966

Tsai, C. C., & Chang, Y. F. (2019). Carbon dynamics and fertility in biochar-amended soils with excessive compost application. *Agronomy*, *9*(9). https://doi.org/10.3390/agronomy9090511

Wan, Z., Sun, Y., Tsang, D. C. W., Yu, I. K. M., Fan, J., Clark, J. H., Zhou, Y., Cao, X., Gao, B., & Ok, Y. S. (2019). A sustainable biochar catalyst synergized with copper heteroatoms and CO2 for singlet oxygenation and electron transfer routes. *Green Chemistry*, *21*(17), 4800–4814. https://doi.org/10.1039/c9gc01843c

Wang, L., Ok, Y. S., Tsang, D. C. W., Alessi, D. S., Rinklebe, J., Wang, H., Mašek, O., Hou, R., O'Connor, D., & Hou, D. (2020). New trends in biochar pyrolysis and modification strategies: feedstock, pyrolysis conditions, sustainability concerns and implications for soil amendment. In *Soil Use and Management* (Vol. 36, Issue 3). https://doi.org/10.1111/sum.12592

Wati, D. R., & Sholihah, W. (2021). Pengontrol pH dan Nutrisi Tanaman Selada pada Hidroponik Sistem NFT Berbasis Arduino. *Multinetics*, *7*(1), 12–20. https://doi.org/10.32722/multinetics.v7i1.3504

Zhao, J. J., Shen, X. J., Domene, X., Alcañiz, J. M., Liao, X., & Palet, C. (2019). Comparison of biochars derived from different types of feedstock and their potential for heavy metal removal in multiple-metal solutions. *Scientific Reports*, *9*(1), 1–12. https://doi.org/10.1038/s41598-019-46234-4

Zhao, N., Yin, Z., Liu, F., Zhang, M., Lv, Y., Hao, Z., Pan, G., & Zhang, J. (2018). Environmentally persistent free radicals mediated removal of Cr(VI) from highly saline water by corn straw biochars. *Bioresource Technology*, *260*(March), 294–301. https://doi.org/10.1016/j.biortech.2018.03.116

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