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HUSK-SAND CHARCOAL IMPROVES THE CHEMICAL QUALITY OF INCEPTISOL SOIL FOR LETTUCE MICROGREEN

Suryani Suryani[1)], Yunita Sabri[2*], Yustitia Akbar[3)], Rahmawati Rahmawati[4)], Desriana Desriana[5)], B.A Martinus[6)], Raimon[7)]

[1,2,3,4,5]Fakultas Pertanian, Universitas Muhammadiyah Sumatera Barat, Padang, Indonesia
[6]Fakultas Farmasi, Universitas Perintis, Padang, Indonesia
[7]Kimia, Politeknik ATI Padang

E-mail : **yunitasabri@gmail.com**

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Name : Yunita Sabri
Affiliation : Fakultas Pertanian, Universitas Muhammadiyah Sumatera Barat
E-mail : **yunitasabri@gmail.com**

ABSTRACT

Inceptisol soil is a soil that is not good chemical and physical quality for the cultivation of lettuce microgreen. However, microgreen is a plant that has many benefits. Microgreens can fight free radicals, are useful as antioxidants, relieve the workload of damaged kidneys and lower bad cholesterol levels, and can reduce the risk of Alzheimer's disease. Several studies have been conducted to improve the soil quality of inceptisol. But improving its chemical quality by using a mixture of husk charcoal and sand and proving the change through the cultivation of lettuce microgreen has not been done much. The purpose of this study is to study the improvement of the chemical quality and physics of inceptisol soil using a mixture of husk charcoal and sand by cultivating lettuce microgreen in the land. This research is a mixture of field research and analysis in the laboratory. before planting and 2 weeks after planting, the land is measured pH, P determination is available by bra method, N conjecturing by means of distillation and spectrophotometry. Determination K uses HCl extraction method. Determination of Zn, Fe, and Ca using DTPA extraction. For analysis of cultivation, results is with RAK, where there are 4 groups with 5 Deuteronomy. The result was a change in pH from 4.7 to 6.9. The content of P, N and K changes from ineligible to fulfilling the requirements for lettuce plants. The results of the analysis provide real different information.

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A B S T R A K

Tanah inceptisol adalah tanah yang kurang bagus kualitas kimia dan fisikanya untuk budidaya microgreen selada. Padahal microgreen merupakan tanaman yang banyak manfaatnya. Mikrogreen dapat melawan radikal bebas, berguna sebagai antioksidan, meringankan beban kerja ginjal yang rusak dan menurunkan kadar kolesterol jahat serta dapat mengurangi resiko penyakit alzeimer. Beberapa penelitian telah dilakukan untuk memperbaiki kualitas tanah inceptisol. Tetapi memperbaiki kualitas kimianya dengan menggunakan campuran arang sekam dan pasir, serta membuktikan perubahan itu melalui budidaya microgreen selada belum banyak dilakukan Tujuan penelitian ini adalah mempelajari perbaikan kualitas kimia dan fisika tanah inceptisol menggunakan campuran arang sekam dan pasir, dengan membudidayakan microgreen selada di lahan tersebut. Penelitian ini campuran penelitian lapangan dan analisa di laboratorium.sebelum ditanami dan 2 minggu setelah penanaman tanah lahan diukur pH, penetapan P tersedia dengan metode Bra, pemgukuran N dengan cara destilasi dan spektrofotometri. Penentuan K menggunakan metoda ekstraksi HCl. Penentuan Zn, Fe, dan Ca dengan menggunakan ekstraksi DTPA. Untuk Analisa hasil budidaya adalah dengan RAK, dimana ada 4 kelompok dengan 3 Ulangan. Hasilnya terjadi perubahan pH dari 4,7 menjadi 6,9. Kandungan P, N dan K berubah dari tidak memenuhi syarat menjadi menenuhi syarat untuk tanaman selada. Hasil Analisa memberikan informasi berbeda nyata.

INTRODUCTION

The vegetable crop being developed now is a microgreen of its various types. Microgreens are light green vegetables (Johnson et al., 2021), (Misra & Gibson, 2021), (Turner et al., 2020), which have a higher nutritional value and more benefits than ordinary vegetables. Microgreen's red and green spinach vegetable contains high acetoxy and is studied in (Rahmani et al., 2021). It also contains high levels of phenols that can function as antimicrobials. Microgreens also contain Flavonoids and carotenoids which are secondary metabolites needed by the human body.

Farms with microgreen usually use coconut shell charcoal, peat soil and humus soil (Misra & Gibson, 2021). Not many people use rice husk charcoal to improve the quality of the soil made by cultivating lettuce microgreen vegetables. The types of vegetables grown are types of radishes such as mustard, lettuce, kale, and even sunflowers. This farm is an alternative farm... Because it does not depend on the seasons and climate such as the cultivation of curly lettuce vegetables (Andika et al., 2018) who uses plastic enclosures to regulate their climate (Andika et al., 2018). To regulate soil moisture is required a mixture of husk charcoal and sand. This mixture is able to absorb and store water. (Kolo & Raharjo, 2016). By using a mixed medium of rice husk charcoal, the tomato plant is enough to water once every five days. Because there is water absorption by rice husk charcoal, microgreen cultivation, in addition to cultivating using media in containers, can also be cultivated on open ground (Salim, 2019).

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Several studies improving soil quality by using husk charcoal have been conducted. Among them by mixing husk charcoal with cow dung (Intan Dharmasika, Susilo Budiyanto, 2019), and to study its effect is trialled on the cultivation of onion plants (Sudartik et al., 2018), The result is not so influential. In addition, rice husk charcoal is mixed with cow dung, used to improve the quality of the soil where corn is cultivated. Likewise, the use of rice husk charcoal mixed with liquid bokashi and used for the improvement the quality of cucumber cultivation soil has been carried out. (Ignatio Ivanlendi Cunino, 2018) And have a positive influence.

Although some studies to improve the quality of the soil by using rice husk charcoal have been done on some vegetables, the cultivation of lettuce vegetable microgreen is not much. So it is necessary to conduct research that uses a mixture of husk charcoal and sand to cultivate lettuce microgreen.

There are two ways to make rice husk charcoal, namely burning it closed or pyrolysis and roasting.(Surdianto et al., 2015). The instrument for making rice husk charcoal is a drum with a hole in the middle and a pipe is placed in the hole. The husks are burned in the drum and the drum is closed during combustion, so the combustion is not complete.

METHODS

Place

This research was conducted in the experimental garden land of the University of Muhammadiyah, West Sumatra. This land type of soil is inceptisol, whose quality does not meet the standards for lettuce cultivation.

Chemicals and substances.

The material includes microgreen seeds of Green Lettuce (Lactuca sativa L.),

Chemicals

The chemicals used are aquades, Larutan *buffer* pH 7,0 dan pH 4,0, KCl 1 M, HCl 5 N, Extractor Bray dan Kurts I (larutan 0,025 N HCl + NH_4F 0,03 N), $(NH_4)6\ Mo_7O_{24}.4H_2O$, $(SbO)C_4H_4O_6$ 0,5 H_2O ,H_2SO_4 concentrated (p.a). ascorbic acid, PO_4 (Titrisol), Extracting solution DTPA pH 7,3, TEA (tri ethanol amine), $CaCl_2.2H_2O$, $CaCl_2$, Standard solution Fe, Cu, Zn, CuSO4 Anhydrous (p.a), Na2SO4 Anhydroust, H_3BO_3, selen, NaOH 40%, boiling stone, Conway indicator, metal red, bromkresol green,

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Instrument

The instrument used are as follows: Analytical balance sheet, 100 ml shake the bottle, Dispenser 50 ml measuring cup-1, Shaker machine, Spray gourd 500 ml, pH meter, UV spectrophotometer, Digestion tube & digestion block, Boiling gourd 250 ml, Erlenmeyer (pyrex) 100 ml bertera, Burette 10 ml, Magnetic stirrer, Test tube, Tube shaker, Kjedal distillation Kjeldahl Digestion Mantle 6x100 AV MK 02 , Flamephotometer. Flame Photometer FP640 Na & K

Determination of pH of the soil.

The soil sample was drawn 10.00 g twice, each put in a shake bottle then added 50 ml of aquades were into one of the bottles (pH H_2O) and 50 ml KCl 1 M into the other bottle (pH KCl). Then homogenized by shaking using a shaker machine for 30 minutes. It resulted in soil suspense and soil suspense, measured pH by pH meters that were calibrated using a *buffer* solution of pH 7.0 and pH 4.0.

Determination P available

P-sticking is available using bray methods as follows: starting with weighing 2,500 g of soil samples <2 mm, coupled with Bray and Kurt I extractors as much as 25 ml, then shaken to homogeneous for 5 minutes. Then filtered and noticed when the solution is cloudy, filtering is done again. Filtered again for a maximum of 5 minutes. After that, it is picked 2 ml of clear extract into the test tube. Meanwhile, a standard solution has been prepared. Then a sample of standard series soils, each plus a reagent of phosphate dyes as much as 10 ml, was shaken so that homogeneous and left for 30 minutes. It measured its absorbance with a spectrophotometer at a wavelength of 693 nm.

Total N Measurements

The sample is destroyed first by weighing 0.500 g of soil sample size <0.5 mm, then inserted into a digest tube. Then added 1 g of selen mixture and 3 ml of concentrated sulfuric acid, instructed to a temperature of 350 oC (3-4 hours). When the white steam comes out and gets a clear extract (about 4 hours), the destruction is completed. The distillation tube is removed, then cooled and then the extract is diluted with ion-free water to exactly 50 ml. After that it is shaken until homogeneous, and left overnight for the particles to settle. Quotes are used for N measurement using colourimetry/Spectrophototometry as follows: Pipettes into test tubes of 2 ml of extract and standard series each. Added consecutive solutions of Sangga Tartrat and Na-fenat as much as 4 ml each, then shaken and left for 10 minutes. Then added 4 ml of NaOCl 5 %, homogenized with

The way it is shaken and after 10 minutes is measured with a spectrophotometer at a wavelength of 636 nm.

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Measurement K

K is determined using a Flamefotometer as follows: First, pickpocket 1 ml of soil sample extract and standard series each into a chemical tube and add 9 ml of La 0.25% solution. Then shake using a tube shaker until homogeneous. Then K is measured with the Flamephotometer tool using a standard series as a comparison.

Measurements of Fe, Zn and Cu.

With DTPA extractors, DTPA can dissolve these metals in the form of khelat compounds. And finally, using AAS (Atomic Absorption Spectrophotometer). The measurement begins by weighing 10.00 g of soil samples that have been smoothed, namely the particle size <2 mm. Then added, 20 ml of DTPA extract solution, then shaken to homogenize with a shake machine for 2 hours. The formed soil suspension is filtered or diffused to obtain a clear extract. Then measured, measuring each element with the AAS tool.

Experiments for the cultivation of microgreennya

Using a Group Random Design (RAK) with three treatments and four groups, there are 20 experimental plots with a tile size of plot 30 cm x 30 cm and in each tile there are 0.3 gr of seeds The observational data was averaged and statistically analyzed with the F test at a real level of 5%.

Observed observation parameters

That is when it appears airy, mango plant microgreen Green lettuce, Percentage of growing microgreen Green lettuce, Weight of Green Lettuce Microgreen Plant. use of rice husk charcoal planting media with sand times (1:1)

RESULTS AND DISCUSSIONS

The results of this study can be explained as follows,

Determination of soil quality, namely pH, N, P and K content and Fe, Zn and Cu

The initial condition of the land soil and at the time of 2 weeks after planting can be analyzed pH, N, P, and K, and Fe, Zn and Cu presented in table 1 below,

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Table 1. Results of measurement of pH, content of N, P and K and Fe, Zn and Cu

Condition	pH	% N	P (ppm)	K Me/100 gr	Fe ppm	Zn ppm	Cu ppm	Mg Me/100 gr
Before planting	4,7	0,23	14,4	0,13	2,65	0,02	1,55	0,72
	4,9	0,25	15,1	0,14	2,71	0,02	1,65	0,71
	4,6	0,24	14,6	0,13	2,56	0,03	1,54	0,74
Average	4.7	0,24	14,7	0,13	2,64	0,23	1,58	0,72
2 weeks after Planting	6,9	0,37	34,09	0,21	5,37	0,01	10,2	0,01
	6,8	0,41	33,5	0,25	5,32	0,02	10,7	0,02
	6,9	0,39	34,37	0,23	5,34	0,01	12,3	0,01
Average	6,9	0,39	33,9	0,23	5,34	0,01	11,1	0,013

From Table 1, it can be explained that the initial analysis of soil quality before planting is the pH of 4.7 then the N content in the soil is 0.24%, the P content is an average of 14.7 ppm, the K content is 0.13 Me / 100 gr, and Fe, Zn Cu and Mg respectively is 2.64 ppm; 0.23 ppm; 1.58 ppm and 0.72 Me/100 gr. This is in accordance with the soil conditions of inceptisol reported by(Sudirja et al., 2017), (Jurnal et al., 2020), (Sharma et al., 2021).

After 2 weeks of planting analyzed again the quality of the soil. Meanwhile, before planting, the land around the planting group is added rice husk charcoal and sand with the following comparison.

Charcoal rice husks and sand times against microgreen in lettuce plants as follows:

1. Rice Husk Charcoal : Sand Kali (1:1
2. Rice Husk Charcoal : Sand Kali (1:2)
3. Rice Husk Charcoal : Pasir Kali (1:3)
4. Rice Husk Charcoal : Sand Kali (1:4)

Measurement of soil quality after the addition of rice husk charcoal and sand as in Table 1, has increased pH so that it can be said to understand the increase in the quality of its resistant chemistry. This is in accordance with research (Pandit et al., 2018), (Suryani, Suryani, Yulesi, Rahmawati Rahmawati, Yustitia Akbar, Desriana, 2021) It's just the difference that he uses biochar.

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Table 2. When It Appears Field Microgreen Green Lettuce on some mediums planting charcoal rice husk with sand times

Planting Media	When Appear Airy (Day)
Rice Husk Charcoal : Sand (1:1)	4
Rice Husk Charcoal : Sand (1:2)	4
Rice Husk Charcoal : Sand (1:3)	4
Rice Husk Charcoal : Sand (1:4)	4

(Data is not processed)

Table 3. High Green Lettuce Microgreen Plant On Some Planting Media Age 15 HST

Planting Media Comparison	Green Lettuce Microgreen Plant Height (cm)
Rice Husk Charcoal : Sand (1:1)	10,2a
Rice Husk Charcoal : Sand (1:2)	9,4 b
Rice Husk Charcoal : Sand (1:3)	8,4 c
Rice Husk Charcoal : Sand (1:4)	7,8 c
KK	13,96%

The numbers in the same column followed by different lowercase letters are different in fact according to the DMRT Test at a level of 5%.

Table 3. Percentage Of Growing Green Lettuce Microgreen Plants On Some Planting Media Age 15 HST (%)

Planting Media Comparison	Percentage Grows Microgreen Green Lettuce (%)
Rice Husk Charcoal : Sand (1:1)	78,5a
Rice Husk Charcoal : Sand (1:2)	77a
Rice Husk Charcoal : Sand (1:3)	75a b
Rice Husk Charcoal : Sand (1:4)	70,2 c
KK	5,72%

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The numbers in the same column followed by different lowercase letters are different in fact according to the DMRT Test at a level of 5%.

Weight of Microgreen Green Lettuce Per Container On Multiple Planting Media (gr)

The results of observations on the percentage of growing green lettuce microgreen plants in some rice husk charcoal planting media and sand times after statistical analysis with the F test at a real level of 5% can be seen in Table 3 and the variety fingerprints can be seen in Appendix 6. 4.

Table 4. Plant WeightMicrogreen Green Lettuce On Some Planting Media Age 15 HST (gr)

Comparison of Rice Husk Charcoal Planting Media and Sand	Green Lettuce Microgreen Plant Weight (gr)
Rice Husk Charcoal : Sand (1:1)	3,9a
Rice Husk Charcoal : Sand (1:2)	3,7a
Rice Husk Charcoal : Sand (1:3)	3,6a
Rice Husk Charcoal : Sand (1:4)	2,9 b
KK	14%

The numbers in the same column followed by different lowercase letters are different in fact according to the DMRT Test at a level of 5%.

CONCLUSIONS

From this study, it can be concluded that a mixture of rice husk charcoal and sand can improve the quality of the soil inceptisol seen from the increase in yield , where it is best with a mixture of rice husk charcoal and sand 1:1, both from the amount of plant weight during harvest and from leaf length and plant height.

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