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Biochar and Local Micro Organism from VCO liquid waste Improves The Quality of Soil Chemical Properties and Kale Production

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Abstract

Kale plant has many health benefits, especially can help cure glaucoma cancer. When planted on inceptisol soil, is not good, so it needs to be improved the quality of the soil. Many have studied Biochar to improve soil quality, but no one has yet combined Biochar with Local Micro Organisms from VCO (Virgin Coconut Oil) liquid waste. So the purpose of this study is to study the improvement of the chemical quality of inceptisol soil for kale plant cultivation, using Biochar with Local Microorganisms from VCO (Virgin Coconut Oil) liquid waste. The materials used are Biochar and MOL from VCO liquid waste, which has previously been added cow dung on the land. The method of making Biochar is by pyrolytic combustion. Cultivation in Kale plants using experimental methods using two-factor GRD namely Biochar and Local microorganism of VCO liquid waste. Biochar with 3 levels and Local microorganism of VCO 4 levels. The content of N, P, K and pH, its analyzed before and after the planting age of 4 weeks. Observed its growth by paying attention to the height of the plant, the number of leaves, the length of the leaves, the width of the leaves and the weight of fresh Kale per plant after harvesting. It turns out that the pH of the soil rose from 4.7 to 6.9; N content from 0.24% to 0.39%; P from 14.4 ppm rose to 33.9 ppm and K from 0.13 me / 100 gr rose to 0.23 me / 100 gr. His Randomized Block Design RBD analysis was analyzed with the SPSS program and the results differed markedly. Improving the quality of inceptisol soil, in the future can increase kale vegetable production.

Keywords: Biochar, waste VCO, Kale, Quality of Soil, manure animal

1.Introduction

Biochar is an imperfect burning charcoal or pyrolysis of solid waste of agricultural waste. The pyrolysis process produces a type of carbon that is converted thermochemically, with limited oxygen. [1]–[5]. The basic ingredients of making biochar that are widely known are wood chips, tree pieces, sugarcane pulp or bagasse, rice husks, corn cobs and plant / agricultural waste. Various types of biochar manufacturing raw materials produce different chemical and physical properties.. Likewise, the temperature in the pyrolysis process also affects biochar production. [6]. If the pyrolysis temperature is below 600 ^{0} C, increase the availability of P of agricultural land [7].

VCO manufacturing waste, namely coconut shells grouped also in agricultural waste, when processed pyrolysis produces Biochar [8]. Biochar resulting from the imperfect burning of coconut shells can increase the quality of agricultural land, through absorption by Carbon, which causes an increase in the availability of P, N and K in the soil [7], [9], so as to increase crop production [8], [10]–[12]. The elements N, P and K are indispensable in the biochemical reactions of plants for their survival and production.. Likewise, Biochar has a sufficient concentration of micro and macro elements such as sodium, copper, potassium, calcium, zinc, magnesium, iron, etc. [6] that can support the survival and production of plants.

Figure 1. Biochar Manufacturing Process

The modification of the process of pyrolysis of coconut shells into Biochar is to use it as a material that improves the chemical properties of the soil [12]. Usually the use of Biochar as a fertilizer for agricultural land, is done by combining it with other materials such as Trichorderma, which serves to improve plant health [13],[14]. The use of Biochar as another soil refiner is to combine it with compost[15]. The selection of compost as a biochar mixture, for the production of plants that are taken by leaves takes precedence, because there will be an increase in the levels of Nitogen, which is needed for leaf production.

Biochar is commonly used to improve less fertile soil conditions such as inceptisol soil [16], [4], [15], [17]. Inceptisol soil is a soil with less good chemical properties for kale cultivation. The chemical properties of soil inceptisol are acids with a pH range of 4.9 to below 7 [18]. While the soil pH favored by Kale is pH 6-7. Inceptisol soils are said to also be young, acidic soils and there are about 15% of the world's soils[19].

Inceptisol soil when planted with Kale vegetables, previously it must be improved in condition, because kale plants want a soil pH of 6 to 7. Kale is a vegetable nicknamed the king of vegetables, because it has a multiplied content of vitamins A and D. In addition, he is also very useful for the involvement of glaucoma cancer (eye cancer)[20], [21].

The basic ingredients of making biochar that are widely known are wood chips, tree pieces, sugarcane pulp or bagasse, rice husks and plant / agricultural waste [22], [23], [24]. In addition, it is also lignin and polymers and petroleum residues. Biochar's way of healing is to perform imperfect combustion or pyrolysis of coconut shells [6], [4][25].

Not much has been discussed about the raw materials for making Biochar from VCO manufacturing waste, namely coconut shells. And most importantly there has not been much discussion of the biochemical study of plants, whose soil conditions are inceptisol or the psychic properties of the soil are improved. So also no one has applied Biochar with animal waste on Kale's cultivation. So this study studied the improvement of inceptisol soil by using a mixture of Biochar and animal waste and applying it to kale cultivation / production.

2.Material and Methods

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.

A.Chemicals and substances.

The ingredients include Kale seedlings (*Brasicca oleraceae var. Acephala*).

B.Chemical.

The chemicals used are aquades, pH buffer solution 7.0 and pH 4.0, HCl 5 N, Bray and Kurts I Extractor (0.025 N HCl + NH_4F 0.03 N solution), $(NH4)_6 Mo_7O_{24}.4H_2O$, TEA (tri ethanol amen), $(SbO)C_4H_4O_6$ 0.5 H_2O, H_2SO_4 concentrated. CaCl2.2H2O, PO_4 (Titrisol), Extracting solution DTPA pH 7.3, $CaCl_2$, KCl 1 M.

C.Instrument.

The tools used are as follows: Analytical balance sheet, 100 ml shake bottle, Dispenser 50 ml measuring cup-1, Shaker machine, Spray gourd 500 ml, pH meter, UV Spectrophotometer (Spectrophotometer UV-VIS 7810), Digestion Tube & digestion block, Boiling gourd 250 ml, Erlenmeyer (pyrex) 100 ml stamped, Burette 10 ml, Magnetic Mixer, Test tube, Tube shaker, Kjedal distillation instrument Kjeldahl Digestion Mantle 6x15-50 ml AV MK 01. Flamefotometer (FP640 Flame Photometer Analyzer Tester K Na Li).

1.Determination of soil pH.

The soil sample weighed 10.00 g twice, each put in a shake bottle, then added 50 ml of aquades to one bottle (pH H_2O) and 50 ml of KCl 1 M into the other bottle (pH KCl). Then homogenized by shaking using a shaker machine for 30 minutes. It produces this soil suspense and soil suspension, measured its pH by a pH meter that has been calibrated using a buffer solution of pH 7.0 and pH 4.0.

2.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 homogene 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 pickped 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, shaken so that homogeneous and left 30 minutes. Then measured its absorbance with a spectrophotometer at a wavelength of 693 nm.

3.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 added 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.

Experiments for his Kale cultivation
Using a Randomized Block Design (RBD) with 5 treatments and 4 groups, so that there are 20 experimental plots with a tile size of 30 cm x 30 cm and in each tile there are 0.3 grams of plant seeds. The observational data was averaged and statistically analyzed with the F test at a real level of 5%.

Observed observation parameters that is, plant height Kale, number of leaves, Weight of Kale Plant. use of biochar and Local Microorganisme.

3.Results and Discussion

Determination of soil quality, namely pH, N, P and K content .The initial condition of the land and at the time of two weeks after planting can be analyzed pH, N, P, and K, presented in the following Table 1,

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

Condition	pH	% N	P (ppm)	K Me/100 gr
Before planting	4.5	0.23	14.4	0.13
	4.9	0.25	15.1	0.14
	4.6	0.24	14.6	0.13
Average	4.7	0.24	14.7	0.13
2 weeks after planting	6.9	0.37	34.09	0.21
	6.8	0.41	3.5	0.25
	6.9	0.39	34.37	0.23
Average	6.9	0.39	33.9	0.23

From Table 1, it can be explained that the initial analysis of soil quality before planting is the pH is 4.7 then the N content in the soil is 0.24%, the P content is on average 14.7 ppm, the K content is 0.13 Me / 100 gr. This is in accordance with the soil conditions of inceptisol reported by [26], that the pH of the soil inceptisol analyzed is 4.44 – 5.78.

This experiment used a Randomized Block Design (RBD) with 5 treatments and 4 group so that there were 20 experimental plots with a plot size of 1 m x 1 m and in each plot there were 4 plants, 2 of which were sample plants. The observational data was averaged and statistically analyzed with the F test at a real level of 5%. The treatment is several doses of Local Microorganisme follows:

A.0 ml LM/ 1 liter air
B.150 ml LM / 1 liter of water
C.300 ml LM / 1 liter of water
D.450 ml LM / 1 liter of water
E.600 ml LM / 1 liter of water

Table 2. High red bean plant Age 6 MST on the administration of some concentration of LMO from VCO

LMO from VCO	Kale plant height (cm)
300 ml/L water	27.24 **a**
600 ml/L water	25.74 **b**
150 ml/L water	25.09 **b**
450 ml/L water	25.07 **b c**
0 ml/L water	23.23 **c**
KK	3.36 %

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

Table 2 shows that the treatment of Local Microorganism leftover VCO manufacturing with a concentration of 300 ml / L of water gives a noticeable different influence with a concentration of 600 ml / L of water, 150 ml / L of water, 450 ml / L of water, and 0 ml / L of water with an average plant height of 27.24 cm. While in treatment with a concentration of 600 ml / L of water, 150 ml / L of water, and 450 ml / L of water is different is not real to each other but is different in fact with the concentration of 0 ml / L of water as well as the concentration of 150 ml / L of water and 450 ml / L of water is different is not real to the concentration of 0 ml / L of water, as well as the concentration of 450 ml / L of water with 0 ml / L of different water is not real to each other.

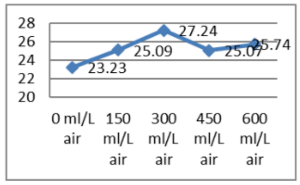

Figure 1. Graph of the effect of giving some concentration of Local Micro organisma from VCO making on plant height (cm)

In general, the provision of LOM from VCO is able to increase the height of Kale plants, but with the provision of a concentration of 300 ml / L of water obtained the highest height of Kale plants, because the concentration is suitable for plant growth compared to lower or higher concentrations, this is also due to the LOM of V. CO contains low N elements that can increase the needs of N plants in increasing the high growth of kale plants.

Table 3. Number of leaves per sample plant at the administration of some concentration of LOM from VCO

LOM of VCO	Number of leaves per sample plant	Sample Plant Weight
600 ml/L water	22.06 **a**	25.75 **a**
450 ml/L water	19.88 **a**	20.56 **a**
300 ml/L water	19.44 **a**	21.19 **a**
150 ml/L water	18.63 **a b**	20.13 **a b**
0 ml/L water	14.44 **b**	14.38 **b**
KK	**15.94 %**	**19.61 %**

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

Table 3 shows that the number of kale plant pods with a concentration of LMO of VCO 600 ml / L water gives the best response to the number of Kale , namely 22.06 pods although it is not real with the treatment of 450 ml / L of water, 300 ml / L of water, and 150 ml / L of water, but it is markedly different from the treatment of 0 ml / L of water, whereas the treatment of 450 ml / L of water is different is not real with the treatment of 300 ml / L of water and 150 ml / L of water but is different markedly from the treatment of 0 ml / L of water, and the treatment of 300 ml / l of water with the treatment of 150 ml / L of water is different is not real with the treatment of 0 ml / L of water and 150 ml / L water is different from each other with the number of leaves 14.44 leaves which is the lowest Number of leaves. As for the number of leaves given with a concentration of 600 ml / L water gives the best response with the number of leaves 54.44 different are not real with the treatment of 450 ml / L of water, and 300 ml / L of water, but different markedly with the treatment of 150 ml / L water and 0 ml / L water. While the concentration of 450 ml / L of water, 300 ml / L of water, 150 ml / L of water and 0 ml / L of water is different is not real each other. Likewise, the weight of leaves per plant with the provision of LMO\ from VCO concentrations of 600 ml / L of water is not real with a concentration of 450 ml / L of water, 300 ml / L of water and 150 ml / L of water, but it is markedly different from the concentration of 0 ml / L of water and the concentration of 450 ml / L of water, 300 ml / L of water and 150 ml / L of water is not real. L and 0 ml/L different water are not real to each other.

4 Conclusion

From the results of the study, it can be concluded that the provision of Local Microorganisma from VCO and Biochar with a concentration of 300 ml / L of water can increase the high growth of kale plants, and the concentration of 450 ml / L of water can increase the yield of kale.

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