

# APPLICATION OF ORGANIC MATTER AND BIOCHAR FOR GROWTH PADDY SOIL AT ENTISOL

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## Abstrack

The Amelioran of organic matter and biochar is a material to repair soil damage and soil nutrient addition to improve soil fertility. The aim of this research was knowed the role of biochar of coconut shell, organic matter of cow and bagasse affecting the growth of paddy soil. Soil organic matter was natural resource composed of all organic components in the soil, which is essential in the determining for fertility of soil. The content of organic matter less than 1% causes soil nutrients to become unavailable. The function of biochar coconut shell donot fertilizer in soil but its ameliorant soil. The utilization of organic waste was pyrolised system for applied in the agricultural for sustainable agriculture.

The application of biochar coconut shell, Organic matter of cow and bagasse can increased growth of paddy soil: growth of plant, number of tillers and number of grains. The application of organic matter and bagasse at dossage 20 tons per hectare shows the number of tillers more than coconut shell biochar. The grain production was determined by support the synergy between soil, nutrients and the environment. The good synergy will be hight production and be come sustainable agriculture.

Key words: Ameliorant, Biochar, Decomposition, Organic matter and Soil Fertility

## Introduction

The total production of plant was indicated for fertility of soil, the decrease of soil nutrition to be continue on the period of planting was important problem in agricultural production. The aims of this research was increased soil organic matter content in paddy soil by utilization of organic waste and biochar for increased total production. The soil organic matter was natural resource composed of all organic components in the soil, which is essential to determined of soil fertility.

The add of continuously organic matter to the soil was technique cheap and easy system to way for add nutrients in soil. The organic matter of soil was susceptible to weathering and leaching, so that soil organic matter content decreases to reach the vulnerable level (Jones, Shannon, Murphy, & Farrar, 2004; Mabuhay, Nakagoshi, & Isagi, 2006; Peltre, Nyord, Bruun, Jensen, & Magid, 2015). The function of biochar in the soil was source of soil carbon and significant to effect on plant growth (Compton & Boone, 2002). The soil carbon content was important factors for binding nutrients to be absorbed by plants (Jackson et al., 2004; Mabuhay et al., 2006; Peltre et al., 2015). The growth of paddy soil was showed a real effect with the provision of biochar as soil ameliorant (Maftuah & Indrayati, 2017). Biochar in the soil can not replace the function as same fertilizer, but its used for soil ameliorant material. thats source of soil carbon for the long time steady in the soil. At the rich of C-organic in the soil made good conditions cause any addition of a nutrients will responsiveness of plant growth.

## Methode

The ameliorant materials was used to add organic matter and biochar source lignin for Entisol. The added was attempt to improved soil characteristics that quickly disrupt soil nutrients. The addition of such ingredients results in soil nutrients becoming more available so that paddy soil are fisiology of plant for the best enhanced and better developed (Compton & Boone, 2002). The research was conducted in green house by survey and descriptive method. The sample take out to direct on the field. The research design was used by completely randomized design with three treatments: Biochar of coconut shell, Organic matter of cow and bagasse with dossage of 0, 10,15 and 20 tons per hectare and each repeated 3 times. The indicator of plant by local wisdom of paddy soil namely "si bangendit". The organic matter of bagasse and cow manure waste was source of soil organic matter while the biochar of

coconut shell was soil C<sub>organic</sub> source by direct decomposition on soil minerals, while coconut shell biochar was carbon source through pyrolysis process with burn by 300-450 °C (Peltre et al., 2015). The biochar material of coconut shell has a high C-organic, > 20% C/N ratio. The material was C/N very high less potency to compost, but Its potency to be charcoal that Its pyrolysis system burning with less oxygen. The physiology of plant observations at one month, two months and three months after growth about: plant growth, number of tillers, and number of grains.

### Result and conclusion

The used of exploitation agricultural land for production was decreased of soil quality and reduced soil organic matter content for uptake of plants and leached process. The addition of organic matter >20 tons per hectare will continuously to repair the soil damage. Its ameliorant function. The application of organic material on agricultural land has been done but the production of plants less than optimal, Its cause the organic material in the soil easily was leached so it takes ameliorant by biochar to stability C organic soil. The organic matter was added to the soil significantly to improve for soil functions ie: physic, chemical and biology of soil. The biochar was more effective for suplay C to steady for long time so that stability of C to take hold nutrients for crop availability than other organic materials such as leaf litter, compost or cow manure (Jackson et al., 2004; Jones et al., 2004). The results of the treatment of decomposed organic and biochar materials in the soil may increase the growth of wetland rice (Table 1).

Table 1. Result of plant growth (cm) after application of biochar coconut shell, organic matter of cow and bagasse

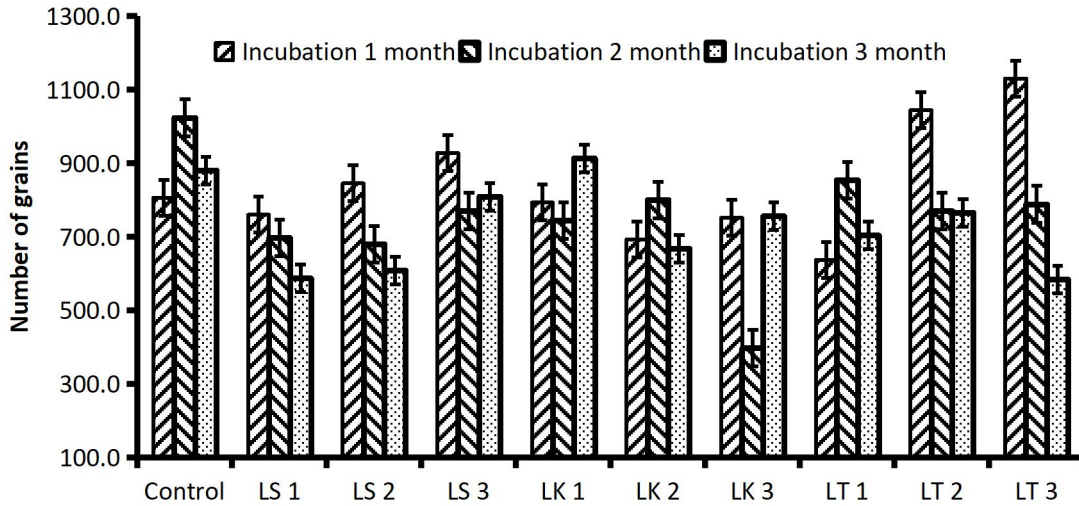
Observations	One month after planting (cm)				Two month after planting (cm)				Three months after planting (cm)			
	0	10	15	20	0	10	15	20	0	10	15	20
Treatment/Dosage	tons per hectare											
Cow manure	77	77.7	72.7	75.3	83	83.7	79.3	76.7	66.3	62.7	65.7	69
Biochar coconut shell	77	74	74	78.3	83	78.3	82.3	76.7	66.3	73.7	68.7	71.7
Bagasse	77	76.7	77.7	74.7	83	85.7	80	79.3	66.3	70.3	73.7	73.3

The application of organic matter into the soil and biochar shell at various dosage not all can increase plant growth was compared to control. Its cause the time of the incubation process in

the soil is very determine the amount of C unsure take by microorganisms of decomposition organic matter in the soil. In the case of coconut shell biochar 20 tons per hectare showed high yield of paddy soil 78.3 cm (Table 1) compared to without ameliorant and cow manure and bagasse. This shows that in the initial phase of soil stability, biochar is formed, while other treatments are decomposed by microorganisms. The application of biochar coconut shell rich in source C can be improved the provision of soil nutrition with better plant growth than other treatments and without treatment. At two month incubation all treatments at various dosage showed lower plant growth than without treatment (control). The two month decomposition on various ameliorant applications of the C-use process in the soil for decomposition was very intensive and produced heat energy so that it can indirectly inhibit the rate of plant growth. After three month incubation the plant growth after was higher the all dosage 10, 15 and 20 ton per hectare than without ameliorant (Table 1). On bagasse provision showed the best growth of the best plant (73.3 cm), compared to other ameliorant treatment and control. The application of bagasse waste was indicated a decomposition process that is slower than other treatments due to high lignin content so that the process of reshuffling materials by microorganisms slower decomposition. The application of bagasse ameliorant in sandy soil was very good because it can inhibit nutrients leached of plant in line with the long time decomposition process (Mabuhay et al., 2006). The effect of application organic matter and coconut shell biochar dosage 20 ton per hectare in incubation 30 days after planting at incubated 1 month resulted in the number of tillers of paddy soil about 10 plant and same to without treatment (Table 2). At the beginning of the incubation the function of organic matter and coconut shell biochar should contribute to the number of tillers but the result noting give correlation to the control, there are environmental stress factors in paddy soil at dry season with high temperature and long dry time.

Table 2. Result of number tillers of paddy soil after application of biochar coconut shell, organic matter of cow manure and bagasse

Observations	Number tiller 30 after days planting at one month incubation				Number tiller 45 after days planting at two month incubation				Number tiller 60 after days planting at three month incubation			
	0	10	15	20	0	10	15	20	0	10	15	20
Treatment/Dosage	tons per hektare											
Cow manure	10	11	9	10	15	14	14	16	11	13	10	12
Biochar coconut shell	10	9	8	10	15	13	16	10	11	11	11	11
Bagasse	10	10	13	10	15	15	15	16	11	11	11	11



Information:

LS1 = Cow manure 10 tons per hektare    LK1 = Biochar coconut shell 10 tons per hektare    LT1 = Bagasse 10 tons per hektare  
 LS2 = Cow manure 15 tons per hektare    LK2 = Biochar coconut shell 15 tons per hektare    LT2 = Bagasse 15 tons per hektare  
 LS3 = Cow manure 20 tons per hektare    LK3 = Biochar coconut shell 20 tons per hektare    LT3 = Bagasse 20 tons per hektare

Figure 1. The number of grains after application of biochar coconut shell, organic matter of cow manure and bagasse.

The number of grains at 45 days after planting in 2 months incubation treatment of cow manure and bagasse was gaved 16 tillers plant. Its higher than the coconut shell biochar treatment (Table 2). Its cause nutrient decomposition of cow manure and bagasse was better for the growth of number tiller paddy soil. While on the coconut shell biochar gave the number of tillers about 10 plant (Table 2), which is smaller than the control and other treatments. The application of biochar coconut shell was function to suppliers of C in the soil and the biochar do not as a fertilizer in the soil. At incubation on three month incubation the number of grains paddy soil at 45 days after planting was higher biochar of coconut shell biochar and bagasse same about 11 grains. its showed that the decomposition process slowly more than the cow manure decomposition. The function of organic matter in biochar in the soil was improved to soil structure, soil aggregation, aeration and capability to holding water for stability of soil moisture. If the soil with the humus content decreases, so gradually the soil will become hard, compact and clumped, making it less productive (Antonious, Turley, & Hill, 2014; Biazin & Sterk, 2013; Costantini & Lorenzetti, 2013; Osman, 2014). The product of grains on paddy soil was supported found of the formation grains quantities in panicles (Figure 1).

Result of Grain on the application of organic matter at one month incubation ameliorant of bagasse at dosage 10 tons per hectare was significant and higher graisult to compared control.

Its cause on the decomposition process of bagasse waste more slowly process than 2 and 3 months decomposition (Fig. 1). While on ameliorant treatment of cow manure and coconut shell biochar after the first month incubation showed the average number of grains under the after 2 months of stress caused by the heat in the dry season which relative long time and high temperature resulted in the number of tillers and the number of grains to be slightly.

## Conclusion

1. The application of organic matter cow manure, waste of bagasse and coconut shell biochar can increased growth of paddy soil about: plant growth, number of tillers and number of grains
2. Incubation three month showed the high growth of paddy soil on various treatments of organic matter and coconut shell biochar was the best growth compared to untreatment
3. The application of organic matter cow manure and waste of bagasse on dosage 20 tons per hectare showed number of tillers more than coconut shell biochar application
4. Function of coconut shell biochar nothing fertilizer buor soil ameliorant source of C-organic. The biochar found to pyrolysis at 350-400 °C was result kind of charcoal
5. The application of organic matter cow manure and coconut shell biochar on paddy soil was low grain by seasonal at dry season be come stress, so that it needs to be tested at various seasons

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