Growth Response of Maize Plant Due to Biochar Rice and Fertilizer of Soil in Kwala Bekala, North of Sumatera

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Abstract. Inceptisol of Soil in Kwala Bekala Deli Serdang is the dominant agricultural land cultivated corn crop. However, the results obtained currently do not meet the desired target by farmers. A greenhouse study has been conducted to evaluate the response of corn plant growth through the application of rice husk biochar and manure on Ultisol of Soil in Kwala Bekala, Deli Serdang, North of Sumatera. This research was conducted using Randomized Block Design of Factor (RBDF) with 2 treatments. Treatment I used by biochar rice husk (B) with 4 levels ie B0 (0 g / polybag), B1 (25 g/polybag), B2 (50 g/polybag) and B3 (75 g/polybag). The second treatment is cow manure (S) with 4 levels i.e. S0 (0 g/polybag), S1 (25 g/polybag), S2 (50 g/polybag) and S3 (75 g/polybag). Each combination of treatments. repeated 3 times so that there are 48 experimental units. The results showed that application of rice husk biochar of 50 g / polybag able to increase P uptake of plants by 9.96 mg / maize plant and increase plant height up to 176.17 cm. Application of cow manure of fertilizer of cow as much as 50 g/polybag can increase uptake of P, plant height, root dry weight and corn plant respectively 6.09 mg/plant, 185.78 cm, 17.06 g and 152.58 g. Meanwhile, rice husk (50 g/polybag) intrusion and cow manure (50 g/polybag) were also able to increase P uptake of corn plant up to 5.39 mg/plant.

1. Introduction
Marginal land is a land that has a low fertility to very low and has the potential as agricultural land. One of the widespread marginal land in Indonesia is dry land containing acidic mineral soils, for example Inceptisol soil. This land is suitable for food crops such as corn and paddy [1]. However, the Inceptisol soil has several problems related to soil fertility.

Phosphorus (P) is one of the macro nutrients that are needed by plants. Phosphorus is an essential nutrient for plants with the function of transferring energy to the genes, which can not be replaced by other nutrients. Inadequate supply P makes the plant does not grow maximal or the potential yield is not maximal or does not complement the normal reproductive process. The availability of phosphorus nutrients is one of the factors of soil fertility, therefore phosphorus is indispensable in plant growth.

Corn plants in their growth require fertile soil to produce well. This is because corn plants need nutrients, especially nitrogen (N), phosphorus (P) and potassium (K) in large quantities. While Inceptisol soil less fertile and need a lot of additional fertilizer and lime [2]. However, phosphorus nutrients are difficult to find because of many problems, one of which is low soil pH.

In overcoming the problems of fertility on marginal land, farmers generally add organic materials such as compost (organic) in addition to using chemical fertilizers. Cow manure is one of organic fertilizer that has nutrient content that support soil fertility and growth of microorganisms in the soil.
Provision of cow manure in addition can increase the availability of nutrients can also improve soil structure [3].

This is in accordance with the literature [4] which states that organic fertilizer is often used as an addition of soil organic matter is cow manure, because it is easily obtained compared with other manure. Nutrients contained in cow manure include N 0.45%, P 0.09%, K 0.36%, Mg 0.09%, S 0.06% and B 0.0045%. At present, in addition to administration the compost material of the farmer is also biochar. Biochar is a black charcoal resulting from the heating process of biomass in a limited oxygen state or without oxygen. Biochar is also an organic material that has stable properties can be used as soil dry land of repaired. The selection of basic biochar raw materials is based on the production of abundant and untapped crop residues [5].

At present biomass production is very abundant and underutilized is rice husk. Chaff as a rice milling waste amounted to 20-23% of grain. Meanwhile, the production of dried unhulled grain (GKG) reached 71.29 million tons, resulting in the amount of husk produced in Indonesia at around 16.39 million tons [6]. Biochar's ability to hold water and nutrients in the soil helps prevent runoff and run-off of fertilizers, thereby allowing fertilizer savings and reducing pollution in the surrounding environment [7]. Based on the above description, researchers interested to examine the growth of corn crops due to biochar rice husk and cow manure on Inceptisol Kwala Bekala Deli Serdang.

2. Materials and Methods
The research was conducted at Greenhouse, Soil Physics Laboratory, Laboratory of Soil Chemistry, Laboratory of Fertility of Soil, Research and Technology Laboratory, Faculty of Agriculture, University of North Sumatera. The study took place in February 2017 s.d May 2017.

The materials used in this research are Inceptisol Soil in Kwala Bekala, Pancur Batu, Deli Serdang Regency as planting medium, corn seed Pioneer P-23 variety as indicator plant, cow manure and biochar rice husk. Supporting equipment needed in the field in the form of polybag, hoe, scales, and label paper. This research was conducted using Group Random Design (RAK) with two treatment factors namely Bio rice husk biochar (B) consist of 4 levels: B0 (0 g/polybag), B1 (25 g/polybag), B2 (50 g/polybag) and B3 (75 g/polybag) and cow manure (S) consist of 4 levels: S0 (0 g/polybag), S1 (25g/polybag), S2 (50 g/polybag) and S3 (75 g/polybag).

Implementation of research conducted is the land preparation and preparation, application of cow manure and biochar rice husk. The parameters observed were P uptake, plant height, crown dry weight and dry weight of root of corn plant. Data of research result which have real effect continued with difference test mean that is Duncan Multiple Range Test with level 5%.

3. Result and Discussion
From Table 1 it can be seen that biochar feeding on corn plant height at B0 is significantly different from B1, B2, and B3. The highest rate of biochar rice husk was found at B2 level of 176.17 cm while the lowest was at B0 level of 152.92 cm. Giving of cow manure to corn plant height at S3 level is significantly different with S0 and S1 level, not significantly different with the level of S2. The highest rate in the application of cow manure is at the S3 level of 189.22 cm while the lowest rate is at the B0 level of 114.67 cm.

Biochar feeding increased significantly in maize compared to control treatment (B0), but not significantly different from other treatments. The treatment with the highest corn plant height on the treatment of biochar 50 g/polybag (B2) is 176.17 cm and the lowest treatment on biochar treatment 0 g/polybag (B0) is 152.92 cm. This is thought to occur because biochar is able to hold more water and affect the pore space of the soil causing the roots to grow freely and absorb many nutrients.

This is in accordance with Ref. [8] who said that the provision of biochar shell and wood can increase the availability of water in the soil. It also affects the availability of soil pore water. Giving cow manure significantly increase plant height, the highest treatment is at 75 g/ polybag level of 189.22 cm. Giving cow manure has a significant effect on plant height, the highest treatment is at 75 g/polybag 189.22 cm. This is because cow manure is an organic material that can improve soil properties, providing nutrients needed by plants. In addition, it is also able to increase the activity of microorganisms so the decomposition occurs in the soil.
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Table 1. Height of Corn Crop on Giving Biochar of Rice Husk and Cow Manure

| Biochar Rice Husk (B) | Cow Manure (S) | S0 (0g/polybag) | S1 (25 g/polybag) | S2 (50 g/polybag) | S3 (75 g/polybag) | Mean |
|----------------------|----------------|-----------------|------------------|------------------|------------------|------|
| B0 (0 g/polybag)    | 89.00          | 168.67          | 178.67           | 175.33           | 152.92b          |
| B1 (25 g/polybag)   | 112.00         | 171.67          | 189.00           | 196.67           | 167.33a          |
| B2 (50 g/polybag)   | 143.00         | 176.33          | 189.67           | 195.67           | 176.17a          |
| B3 (75 g/polybag)   | 126.33         | 182.33          | 196.33           | 194.33           | 174.83a          |
| Mean                | 114.67c        | 172.22b         | 185.78a          | 189.22a          | 165.47           |

Description: The numbers followed by different notations show significantly different at the 5% level.

This is supported by Ref. [3] which explains that cow manure is one of the organic fertilizer that has nutrient content that supports soil fertility and growth of microorganisms in the soil. Provision of cow manure in addition to increasing the availability of nutrients can also improve soil structure. Manure has natural properties and does not damage the soil. Manure provides macro nutrients (N, P, K, Ca and S) as well as micro elements (Fe, Zn, B, Co, and Mo).

From Table 2 it can be seen that the application of cow manure at S3 level is not significantly different with the level of S1 and S2, significantly different with the level of S0. The highest rate for biochar rice husk was found at B2 level of 21.58 g while the lowest level was at B0 level of 11.87 g. The highest rate for the application of cow manure is at the level of S3 which is 24.14 g while the lowest rate is at the S0 level of 4.72 g. Giving cow manure has a significant effect to increase the dry weight of roots of corn plants, the highest treatment is at 75 g/polybag 24.14 g. This is because cow manure is an organic material that can improve soil properties, providing nutrients needed by plants. In addition, it is also able to increase the activity of microorganisms so that decomposition occurs in the soil.

Table 2. Dry Weed Root of Corn Plant on Giving Biochar of Rice Husk and Cow Manure

| Biochar Rice Husk (B) | Cow Manure (S) | S0 (0g/polybag) | S1 (25 g/polybag) | S2 (50 g/polybag) | S3 (75 g/polybag) | Mean |
|----------------------|----------------|-----------------|------------------|------------------|------------------|------|
| B0 (0 g/polybag)    | 2.40           | 13.66           | 14.70            | 16.72            | 11.87            |
| B1 (25 g/polybag)   | 3.94           | 13.32           | 12.72            | 21.18            | 12.79            |
| B2 (50 g/polybag)   | 6.77           | 13.11           | 26.70            | 39.74            | 21.58            |
| B3 (75 g/polybag)   | 5.77           | 15.84           | 14.11            | 18.92            | 13.66            |
| Mean                | 4.72b          | 13.98a          | 17.06 a          | 24.14 a          | 14.97            |

Description: The numbers followed by different notations show significantly different at the 5% level.

From Table 3 it can be seen that the application of cow manure at S3 level is significantly different with the S0 and S1 levels, not significantly different from the level of S2. The highest rate for rice husk biochar was at B3 level of 131.49 g while the lowest level was at B0 level of 100.19 g. The highest rate for the application of cow manure is at the S3 level of 159.47 g while the lowest average is at the S0
level of 34.30 g. Giving cow manure significantly influence dry weight of canopy corn plant, the highest treatment at 75 g/polybag 159.47 g. This is because cow manure is an organic material that can improve soil properties, providing nutrients needed by plants. In addition, it is also able to increase the activity of microorganisms so decomposition occurs in the soil.

Table 3. Dry Weight of Corn Crops on the Application of Biochar of Rice Husk and Cow Manure

| Biochar          | Cow Manure (S) |          |          |          | Mean          |
|------------------|----------------|----------|----------|----------|--------------|
| Rice Husk (B)    |                | S0(0 g/polybag) | S1 (25 g/polybag) | S2 (50 g/polybag) | S3 (75g/polybag) |
| B0 (0 g/polybag) | 12.68          | 104.92   | 146.27   | 136.88   | 100.19       |
| B1 (25 g/polybag)| 26.02          | 122.43   | 157.08   | 103.32   | 102.21       |
| B2 (50 g/polybag)| 58.51          | 118.42   | 125.66   | 205.00   | 126.90       |
| B3 (75 g/polybag)| 39.97          | 112.02   | 181.31   | 192.66   | 131.49       |
| Mean             | 34.30c         | 114.45b  | 152.58a  | 159.47a  | 115.20       |

Description: The numbers followed by different notations show significantly different at the 5%

This is supported by Ref. [3], [8], [9] which explains that cow manure is one of the organic fertilizer that has nutrient content that supports soil fertility and growth of microorganisms in the soil. Provision of cow manure in addition to increasing the availability of nutrients can also improve soil structure. Manure has natural properties and does not damage the soil. Manure provides macro nutrients (N, P, K, Ca and S) as well as micro elements (Fe, Zn, B, Co, and Mo).

From Table 4 it can be seen that rice bran biochar assimilation at B3 level is significantly different from B0 and B1 and not significantly different with B3 level. Giving of cow manure at S3 level was significantly different with S0 and S1 level, not significantly different with the level of S2. The highest rate for rice husk biochar was found at B3 level of 6.14 mg/plant while the lowest was at B0 level of 3.72 mg/plant. The highest rate for the application of cow manure is at the S3 level of 7.68 mg/plant while the lowest rate is at the S0 level of 1.49 mg/plant.

Table 4. Uptake of P Plant Corn on Giving Biochar of Rice Husk and Cow Manure

| Biochar          | Cow Manure (S) |          |          |          | Mean          |
|------------------|----------------|----------|----------|----------|--------------|
| Rice Husk (B)    |                | 0 (g/polybag) | 25 (g/polybag) | 50 (g/polybag) | 75 (g/polybag) |
| 0 g/polybag      | 0.51           | 3.10     | 5.19     | 6.09     | 3.72b        |
| 25 g/polybag     | 1.04           | 5.26     | 5.68     | 4.02     | 4.00b        |
| 50 g/polybag     | 2.47           | 5.00     | 5.39     | 9.96     | 5.70ab       |
| 75 g/polybag     | 1.96           | 3.84     | 8.12     | 10.63    | 6.14a        |
| Mean             | 1.49c          | 4.30b    | 6.09ab   | 7.68a    | 4.89         |

Description: The numbers followed by different notations show significantly different at the 5%
Biochar rice husk gave significant effect to increase phosphorus (P) plant nutrient uptake. Can be increased allegedly caused by increased nutrient P in the soil. This is supported by Ref. [7], [10] which states that biochar's ability to hold water and nutrients in the soil helps prevent runoff and leaching, thereby allowing fertilizer savings and reducing pollution in the surrounding environment. The ability to retain moisture can help the plants during periods of drought. Biochar is also very important in enriching organic carbon in marginal soils and accelerating the development of microbes for nutrient absorption in the soil.

Provision of real cow manure enhances P uptake of plants with the highest treatment of 75 g/polybag. This is because corn crops are able to absorb nutrients of P that are already well available by corn crops, so the uptake of real plant P increases. This is in accordance with the literature Ref. [4, 11], who states that organic fertilizer is often used as an addition of soil organic matter is cow manure, because it is easily obtained compared with other manure. Nutrients contained in cow manure are N 0.45%, P 0.09%, K 0.36%, Mg 0.09%, S 0.06% and B 0.0045%. As explained by Ref. [12], [13] that the combination of rice husk biochar application 5 ton/ha with liquid organic fertilizer (10 L/ha) can increase the papa of corn crop up to 82.39 mg/plant and higher than without the application of both 65.07 mg/plant).

4. Conclusions
Giving of rice husk biochar 50 g/polybag or 20 ton/ha can increase the growth of maize plant on the parameters of corn plant height of 176.17 cm and the absorption of corn plant of 5.7 mg/plant. Giving of cow manure 50 g/polybag equivalent to 20 tons/ha also able to increase the growth of corn plant on high parameter of corn plant equal to 176.17 cm, dry weight of crown equal to 152.58 gram, root dry weight of 17.06 gram and maize uptake equal to 6.09 mg/plant. The interaction of biochar rice husk and cow manure tended to increase the growth of maize crop at dose each 50 gr/polybag or equal to 20 ton/ha.

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