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Effect of Giving Compost on Some Physical Properties of Entisol and the Growth of Corn (Zea mays L)

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ABSTRACT

This study aims to 1) compare the effect of applying rice straw compost and campus waste compost on several soil physical properties. 2) Comparing the effect of compost dosing on several soil physical properties. 3) Knowing the effect of rice straw compost and campus waste compost on the growth of corn plants. The hypotheses of this study are 1) Applying campus waste compost will have a better effect than rice straw compost in improving some soil physical properties. 2) Applying the highest dose of compost will have a better effect on improving some of the physical properties of the soil. 3) The provision of rice straw compost and campus waste compost can improve the growth of corn plants in Entisols. Entisols are soils that have a sand or loamy sand texture, so they have low water holding capacity and very low organic matter. One way to overcome the low nutrient content in the soil is by adding organic matter in the form of compost.

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1. INTRODUCTION

Soil is a growing medium and provider of nutrients for plants. The availability of nutrients in the soil is one of the factors that support plant growth in addition to soil physical and biological factors. Entisols are soils that have a sand or loamy sand texture, so they have low water holding capacity and very low organic matter. The composition of soil structure, texture and pore space are factors that affect water holding capacity.

In addition, Entisol also has a very low organic matter content, this is due to very high leaching. One way to overcome the low nutrient content in the soil is by adding organic matter in the form of compost. In the decomposition of organic matter requires microorganisms that act as decomposers so that the process takes place perfectly and faster.

Most people use EM (Effective Microorganisms) which are widely sold in the market even though using EM solutions does not necessarily play a maximum role in the decomposition of organic matter.

For this reason, it is necessary to make the EM solution yourself by taking microorganisms from the material to be composted. Making compost from rice straw and campus waste is quite easy and inexpensive and most importantly is the impact on soil fertility and plant growth.

The decrease in soil fertility in wet climates is caused by a decrease in organic matter content. Organic matter is biologically the main source of energy for microorganisms in soil and physically influences soil aggregation and water retention. Organic matter in the soil ranges from 1-5% but its presence has a very large influence on soil properties both physical, chemical and biological.

With the addition of organic matter in the form of rice straw compost and campus waste compost, it is hoped that it can improve the physical properties of the soil, increase the nutrient content in the soil, increase the soil's ability to hold water, reduce leaching and also increase plant growth and reduce the problem of accumulation of agricultural waste.

2. METHOD

2.1 Types of research

type of qualitative research by processing secondary and primary data. Primary data which will be obtained from data that is descriptive and observed so that it is in accordance with the facts in the field.

2.2 Research variable

The variables used are independent variables with the observed variables including: soil organic matter (6MSP), soil physical properties (density, specific gravity, porosity, distribution pores, and aggregate stability)

2.3 Research design

The study was conducted in a completely randomized design (CRD) factorial with 12 treatment combinations consisting of two factors, the first factor was the type of compost (K1: Straw compost decomposed with EM4, K2: Straw compost decomposed with Isolates, K3: Campus waste compost decomposed with EM4 , K4: Campus waste compost is decomposed by isolates) and the second factor is the dose of compost (D1: 10 tons ha-1, D2: 20 tons ha-1, D3: 30 tonnes ha-1) with 3 replicates

2.4 Sampling Locations.

This study used 4 types of samples by taking samples at different locations.

2.5 Time and Location of Research

This research was conducted from March 2007 to June 2007 in the greenhouse of the Faculty of Agriculture, University of Brawijaya Malang and a basic analysis of soil and organic matter as well as physical analysis of the soil was carried out in the Chemistry and Physics Laboratory of the Department of Soil, Faculty

2.6 Tools and materials

The tools used in this study were polybags, scales, equipment for taking soil samples (rings, shovels, knives), equipment for laboratory analysis for both basic analysis and analysis of soil physical properties (pipette, flask, hotplate, oven, plastic, paper). labels, sand boxes, pressure plates, spray bottles) while the organic materials used were rice straw compost and campus waste compost taken from the final results of the study.

2.7 Research procedure

Observation of soil incubation is carried out every 2 weeks, this is done based on the results of previous studies which show that the effect of municipal organic waste on soil physical properties does not significantly affect 7 HSP and observations are made taking into account the physical properties of soil and plants.

2.8 Data Analysis.

The analysis used in this research is basic soil analysis:

Table 1. Types of Basic Soil Analysis

Kinds of Basic Analysis	Method
Fill Weight	Whole soil sample (ring)
Specific gravity	Pycnometer
Aggregate stability	Vilensky
Texture	Pipette
Moisture content pF 0, 2, 2.5, 4.2	pF curve
soil pH	PH meter
C Organic	Walker & Black
CEC	NH4OAc 1N pH7

In addition to soil analysis, analysis was also carried out on the organic materials used, namely rice straw and campus waste materials. Kinds of basic analysis of organic matter.

Table 2. Kinds of Basic Analysis of Organic Materials

Kinds of Organic Material Analysis	Method
C Organic (Organic Material)	Walker & Black
N Total	Kjeldal
pH	pH meter

3. RESULTS AND DISCUSSION

3.1 Research result.

Effect of composting campus waste, rice straw compost and entisol on soil organic matter and some soil physical properties which include: (1) soil unit weight, (2) specific gravity, (3) total porosity, (4) pore space distribution, (5) aggregate stability. The growth of corn plants includes: (1) plant height (2) number of leaves, (3) fresh weight and (4) dry weight.

3.1.1 Soil Organic Matter

Measurement of soil organic matter was carried out 6 weeks after treatment. The interaction of compost application and dosage level did not significantly affect soil organic matter content. Meanwhile, the single effect of both compost application and dosage level had a significant effect on the organic matter content.

Applying compost can increase plant growth and improve soil physical properties because any material that functions to increase the activity of microorganisms in the decomposition process is called an activator which is usually present in the compost applied to the soil. Organic activators are materials that contain nitrogen in large quantities and in various forms including proteins, amino acids and urea.

Table 3. Average Soil Organic Matter Content at 6 MSP.

Treatment	BOT (%)	Enhancement (%)
K1	2.26 a	0
K2	2.39 ab	5.75
K3	2.31 a	2,21
K4	2.46 a	8.85
D1	2.28 A	0
D2	2.35 AB	3.07
D3	2.40 B	5,26

Note: Numbers followed by the same letter in the same column are not significantly different (Duncan's test at 5% level).

3.1.2 Soil Physical Properties

On the nature of the soil content, the application of compost and the level of dosage in all observations had no significant effect on the bulk density of the soil. Meanwhile, the effect of composting on soil bulk density had a significant effect at 2.6 MSP and a very significant effect at 4.8 MSP. In general, the average value of soil unit weight in the various treatments decreased with increasing observation time. This is due to the influence of soil organic matter content.

Application of compost and level of application (dose) from all observations did not significantly affect soil density. Likewise, the single effect of adding compost also had no significant effect. The application of compost to the total porosity of the soil has a very significant effect because the dosage of compost on the soil is different, so the result of the total porosity of the soil in all treatments tends to show a different pattern according to the dose.

Applying organic matter in the form of rice straw compost and campus waste compost to the soil, the longer it will decompose and produce humus. Humus plays a role in binding soil particles in the soil aggregation process, so that it can change the composition of the soil solids. With a change in soil volume that is getting lighter, so that it affects the bulk density of the soil as well as the application of compost and the level of application (dose) from all observations the single effect of applying compost also has no significant effect and the application of compost to the soil has a very significant effect on the total porosity of the soil.

Applying compost to the soil provides space for the soil pores so that the part of the soil occupied by water and air becomes a place for plant growth and development. application of compost also affects the stability of the aggregate which affects soil resistance to rainwater blows. The addition of organic matter to the soil will make the bonds between particles grow stronger with increasing levels of organic matter in the soil. The positive correlation between aggregate stability with porosity and groundwater availability indicates that an increase in aggregation can increase total porosity and available water.

3.1.3 Plant Growth

Plant height measurements were carried out at 2, 3, 4, 5 and 6 WAP. The application of compost had a significant effect on the observations at 5 WAP and was highly significant at 6 WAP. Meanwhile, the dosage level of compost at 2 WAP did not have a significant effect.

Tabel 3. The average plant growth in the treatment

Treatment	Plant Height (cm)				
	2 MST	3 MST	4 MST	5 MST	6 MST
K1	34,39a	40.39 a	45,17a	54,17 a	64.22 a
K2	36,22 a	42.06a	46,28 a	58.28 ab	66.11 a
K3	34.61 a	40.89 a	45,44 a	22.72 a	72.52b
K4	36.94 a	42.61 a	48.06a	60,67 b	75.11 b
D1	34.12 A	39.33 A	44.08 A	53.58 A	65.42 A
D2	35.42 A	41.83 AB	45.58 A	56.46 A	68.37 A
D3	37.08 A	43.29 A	49.04 B	61.58 B	74.68 B

Note: Numbers followed by the same letter in the same column are not significantly different (Duncan's test at 5%)

The number of leaves is directly proportional to the height of the plant, that is, the higher the plant, the more leaves will be. As in plant height, compost application and compost dosing rate, the highest number of leaves was in the K4 treatment (campus waste compost with indigenous isolates).

From the beginning of growth to the vegetative phase of corn plant growth, especially the number of leaves still shows a uniform number. This is because the corn plant still utilizes the food reserves in the seed endosperm. So that nutrient absorption is still not optimal because the leaves are relatively younger.

Improvements in the physical properties of the soil, especially the stability of crushed aggregates and crushed aggregates, will affect the increase in total porosity, micro pores and decrease in macro pores and consequently the bulk density of the soil becomes lower. With a low bulk density of soil, it will reduce the occurrence of soil compaction. Large pore space will facilitate the exchange of air and water in the soil so as to ensure the availability of water needed by plants and plant growth for the better. this causes the correlation in plant height to change while the number of leaves does not change.

3.2 Discussion.

From the results of the research described above, it can be seen that the application of compost at various dosage levels can improve the physical properties of the soil. This indicates that the application of organic matter can reduce the bulk density of the soil. In accordance with the statement of Utomo and Islami (1995), that soil with a high organic matter content has a low bulk density. Regression test shows that available pore water has a big effect on bulk density, porosity and aggregate stability.

The addition of organic matter to the soil will make the bonds between particles grow stronger with increasing levels of organic matter in the soil. A positive correlation also occurs between soil organic matter and aggregate stability. The physical properties of the soil, especially the stability of broken aggregates and the stability of crushed aggregates, will affect the increase in total porosity, micro pores and decrease in macro pores and consequently the bulk density of the soil becomes lower.

This is in accordance with what was said by Kohnke, 1989 (in Bakri, 2001) that if sufficient pore water is available, the role of the water can be optimal in supplying nutrients to plants, supporting microorganisms, and lifting dissolved oxygen to the root area.

4. CONCLUSION

The results of research on the effect of composting rice straw and campus waste compost on some of the physical properties of Entisols and the growth of corn plants (Zea mays L), can be concluded as follows. Provision of campus waste compost decomposed with indigenous isolates has the best effect on improving soil physical properties. Among them are able to reduce soil bulk density, specific gravity, and fast drainage pores. Increases total soil porosity, slow pore drainage and available water pores and aggregate stability. Dosage of 30 ton ha-1 compost had the best effect on improving some of the physical properties of the soil. Among them are able to reduce soil bulk density, specific gravity, and fast drainage pores. Increases total soil porosity, slow pore drainage and available water pores and aggregate stability. Improvement of soil physical properties due to the provision of compost is able to improve corn plant growth.

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There is a need for research on the effect of a combination of campus waste compost and rice straw compost in improving the physical, chemical and biological properties of the soil and the need for additional observation time until corn crop production regarding the effect of campus waste compost and rice straw compost directly in the field.

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