

Effect of Organic Matter on Growth of Arabica Coffe (*Coffea Arabica*) Variety

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Abstract

The research was conducted in Maliana, Bobonaro District, Timor Leste to evaluate the effect of using organic matter on the growth of Arabica coffee varieties. The experiment was laid out in a completely randomized design (CRD) with four treatments and three replications. The variables observed were the height of the plant, diameter of the stem, number of leaves, length of root, weight of fresh biological yield, and weight of dry biological yield. The results showed significant differences in agronomic traits in plant height, stem diameter, fresh weight of biological yield and root length. However, we did not detect any difference in the number of leaves or the dry biological yield. The addition of cow manure gave higher yields than ground coffee and wood powder and did not provide organic matter. The application of cow manure resulted in higher yields than the other treatments for all variables, successively plant height (24.63 cm), stem diameter (0.34 cm), number of leaves (12.45 sheet), fresh weight of biological yield (24.36 gr), dry weight of biological yield (12.67 gr) and root length (22.95 cm).

Keywords: Organic Matter; Growth; Arabica coffee variety.

1. Introduction

Coffee is a plant that is very popular and growing throughout the world. The majority of coffee commodities in Timor Leste are Arabica and Robusta, whose development was brought by the Portuguese and Indonesians. Coffee is a plant whose result is in the form of seeds that are best known to humans. Coffee is used not only as a refresher for the mind and body but also causes loss of drowsiness [4]. The foreign exchange generated in 2007-2008 reached US\$ 35,000 from Timor Leste's coffee production of approximately 14,008.3 tons with an area of 52,030 hectares [1]. The productivity of Timor Leste coffee does not increase from year to year because the quantity of production is not matched by an increase in quality; as a result, the price of coffee will decline in the international market.

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One of the reasons for the low productivity of coffee plants at the farm level is the lack of knowledge about the benefits of using organic materials, which can directly affect the quality and quantity of Arabica yields. The organic matter content in the soil needs to be considered in the development of coffee plants. Organic matter contains the elements carbon and nitrogen in varying amounts, and the balance of these elements is very important in maintaining and improving soil fertility [8]. The addition of organic matter every year is necessary if soil fertility is to be maintained. The application of organic materials such as animal manure, coffee grounds, and wood powder needs to be considered to reduce the impact of depletion of organic matter [3]. The use of organic matter in Arabica coffee varieties can improve the physical and chemical properties of the soil so that plant roots can absorb nutrients in the soil perfectly [6].

1.1. Objectives

The research aims are as follows: 1. Knowing the effect of organic materials on the growth of Arabica coffee variety. 2. The effect of various organic materials was compared to obtain better growth of the arabica coffee variety.

2. Research Methods

The research was carried out in Suco Ritabou Maliana Sub District, Bobonaro District, from May to August 2010 at an altitude of 400 meters above sea level to determine the effect of various organic materials on the growth of the Arabica coffee variety. A factorial design was arranged in a completely randomized design (CRD) with four treatments that were repeated in three replications. The treatments consist of organic materials (BOs), which consist of 4 levels, namely, 1. Without organic matter (M0) 2. Wood powder (M1), 3. Coffee grounds (M2) 4. Cow manure (M3). The agronomic traits observed were plant height, stem diameter, and number of leaves. The fresh and dry weights of the biological yield were measured at 90 days after transplanting. Root length measurements were carried out on sample plants per polybag by pulling one of the longest roots after which it was measured using a mister/meter.

2.1. Data Analysis

All data obtained from the research results were analyzed using analysis of variance (ANOVA), and if a significant difference was indicated, a follow-up test with LSD 5% was performed.

3. Results and Discussion

The results showed that organic matter had a significant effect on plant height and stem diameter. Without the addition of organic matter there was no difference in the effect of the addition of wood powder organic matter on both variables. The application of cow manure showed different effects without organic matter and wood powder however, it showed nonsignificant differences from coffee grounds. Without the application of organic matter and with the application of wood powder there was a nonsignificant difference in plant height with coffee grounds. On the other hand, significant differences were detected between coffee ground and wood powder as well as without organic matter.

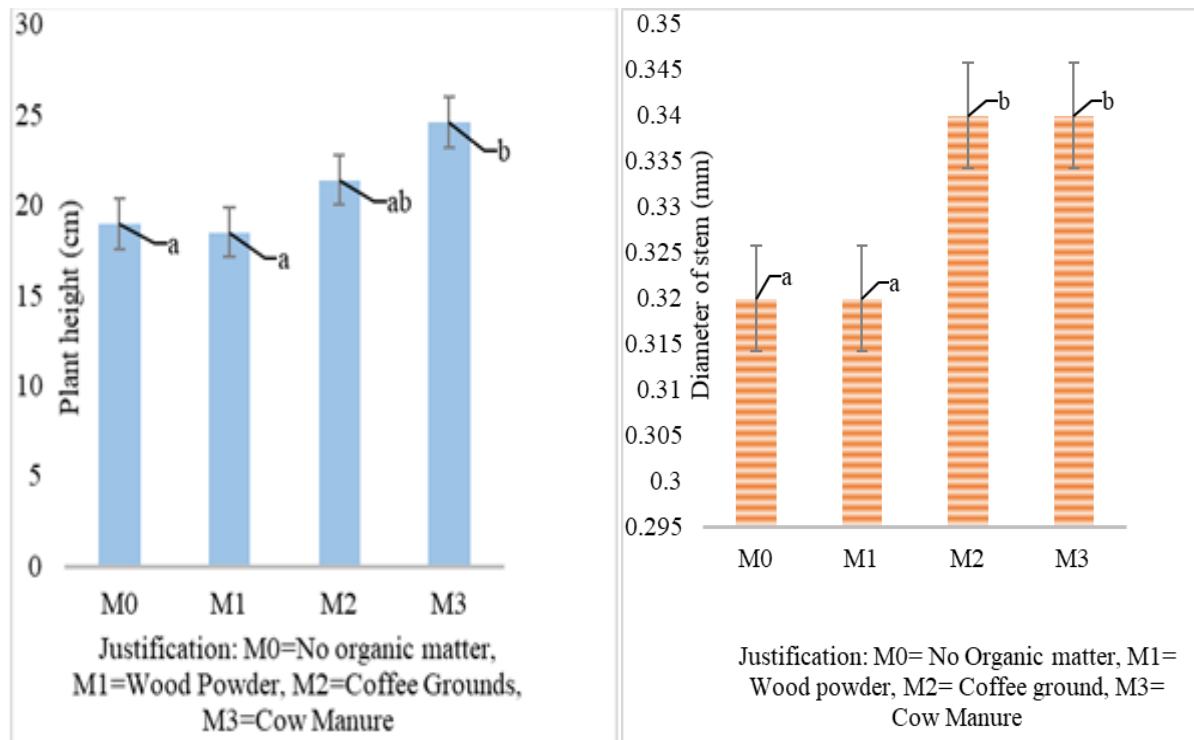


Figure 1: Effect of organic matter on plant height. **Figure 2:** Effect of organic matter diameter of stem (cm).

Note: The same lowercase letters at the top of the histogram do not show a significant difference at the LSD level of 5%.

The results showed that the application of cow manure was more effective and influenced plant growth, especially plant height and stem diameter, than the application of wood powder without organic matter (pictures 1 and 2). The results in Figure 1 show that the application of cow manure has better results, namely, (24.63 cm) from the provision of other organic materials (coffee ground 21.42 cm, wood powder 18.52 cm) and without organic matter (18.99 cm) at plant height. Figure 2 shows higher yields obtained by cow manure treatment (0.34 cm) followed by coffee grounds (0.34 cm), wood powder (0.32 cm) and without organic matter (0.32 cm). Plant growth is better from applying cow manure than other organic matter or without organic matter, and it can be said that cow manure is a good substrate for anaerobic fermentation by methane bacteria.

The decomposition process is faster and better because the number of bacteria is greater, including actinomycetes, so that it has a direct or indirect influence on plant growth. Organic matter is a natural substrate for saprophytic microorganisms and indirectly provides nutrients to plants through soil microorganism activities (Rao, N.S. S., 1994). The graphic below shows that applying organic matter does not affect the number of leaves. However, higher yields are shown by the application of manure (12.45 sheets) of cows and coffee ground (12.20 sheets), wood powder (12.15 sheets) and without organic matter (12.05 sheets). These results show that the application of organic matter to soil can be absorbed by plants over a fairly long period. The C/N ratio is a criterion for organic matter related to the total organic matter content. Organic matter that becomes a stable organic fertilizer has a ratio between 10/1 - 15/1 [6].

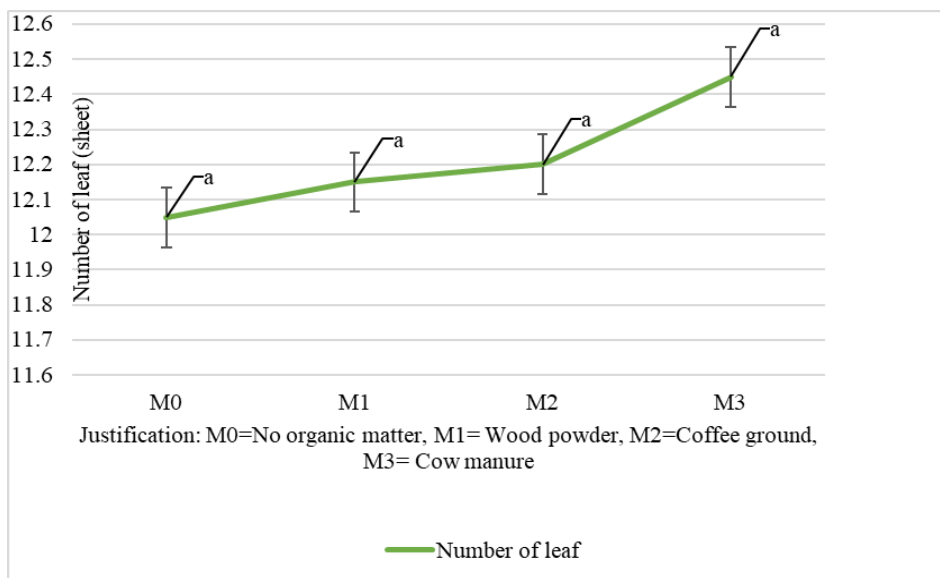


Figure 3: Effect of organic matter on number of leaves (sheet).

Note: The line of graph followed by the same lowercase letters does not show a significant difference at the LSD level of 5%.

The results of the analysis identified that there was a noticeable influence of organic matter on the fresh biomass, dry biomass and root length (figure 4). The application of cow manure has a different effect than that without the application of organic matter. However, there was no difference in the influence of the application of coffee ground and wood powder on the fresh weight of the biomass, the dry weight of the biomass and the length of the roots. Although not different from the application of coffee ground and wood powder, the application of cow manure gave higher yields in fresh biomass (24.36 gr), dry-biomass (14.67 gr) and root length (22.95 cm), which is followed by the provision of coffee ground (23.67 gr, 14.67 gr, 21.66 cm) wood powder (23.52 gr, 13.83 gr, 21.45 cm) and the lowest value in the application without the provision of organic matter (22.77 gr, 11.33 gr, 20.76 cm), as shown in Figure 4.

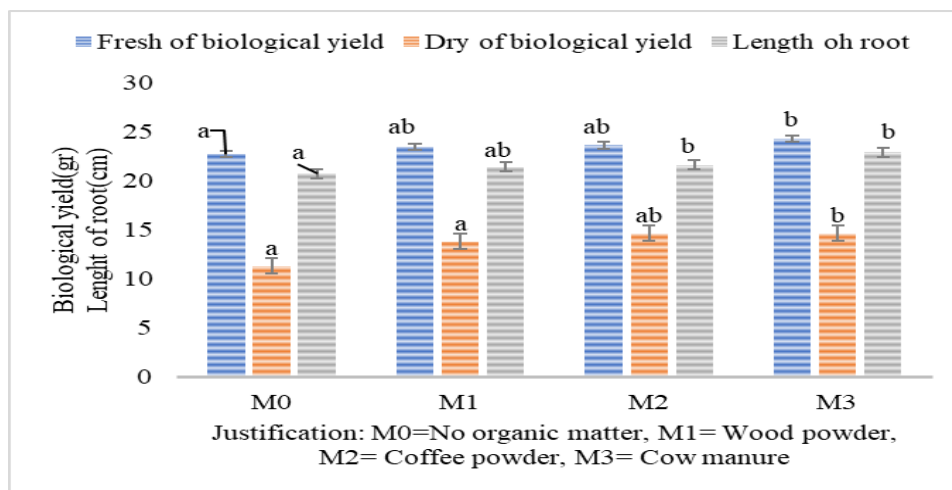


Figure 4: Effect of organic matter on Fresh of biomass (gr), dry of biomass (gr), length of root (cm).

Note: Numbers at the top of the histogram followed by the same lowercase letters do not show a significant difference at the LSD level of 5%.

The high value of the treatment of applying cow manure compared to other organic matter is caused by cow manure containing high fiber, which plays a role in improving soil physical properties [7]. Cow manure is known to have high levels of nitrogen (N), phosphate (P) and potassium (K) along with other minerals such as magnesium, iron and manganese (2).

4. Conclusion

The research concluded that the application of organic matter commonly affects the growth of coffee plants when applied in material- and time-dependent manner. The application of cow manure was more effective than the application of other organic matter on coffee plant growth. There was no indicated effect of organic material on the number of leaves; however, a higher value was obtained the application of cow manure, namely, 12.45 sheets, and a low value was obtained without the application of organic matter, namely, 12.05 sheets.

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