



Utilization of Fermented Cow Stool on the Growth of Moringa Oleifera

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Abstract: Fermented cow stool as organic fertilizer is more easily absorbed by plants, because the complex compounds have broken down and turns into liquid form. The research aim to observed the effect of organic fermented cow stool application on the growth of Moringa Oleifera. The research was conducted at the Bandar Khelifa Village, Deli Serdang Regency, North Sumatera Province from September to November 2020. The design used Completely Randomized Design in 4 treatments and 5 replications. The treatments consisted of P0 = Control (without fertilizer), P1 = 5 ml (fertilizer), P2 = 10 ml (fertilizer), P3 = 15 ml (fertilizer). The parameters observed were plant height, number of stem branches, leaf width and stem diameter. The results showed that the effect of fermented cow stool application had significant effect ($P < 0.05$) on increasing plant height, leaf width, and stem diameter, but not significant on increasing number of stem branches and number of leaves. It is recommended to support good growth (plant height, leaf width and stem diameter) of Moringa Oleifera plants using a 5 ml dose of fermented cow feces fertilization.

Keywords: fermented cow stool, moringa oleifera, plant height

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1. Introduction

Cow feces and fruits waste from local market were problems that were often faced by the community. Strong smells and a dirty environment were often the complaints of the surrounding community. Livestock waste, especially feces, was a waste product from livestock which was a source of microorganisms and contains organic material that had the potential to become contaminants if not handled properly [1].

Utilization of livestock waste and market waste is an alternative in increasing the production of organic fertilizers which was done optimally and can be applied to agricultural crops such as horticultural crops or forage for livestock so that there was zero waste and this was an added value to the income of farmers or breeders. Indicators of the quality of solid organic fertilizer for cattle according to SNI 19-7030-2004 contain a minimum of nutrients including Nitrogen (N) 0.40%, Phosphorus (P₂O₅) 0.10% and Potassium (K₂O) 0.20% [2].

Moringa oleifera forage was a plant source of nutrients that has the potential to be a forage feed because it has quality, easy to obtain, sustainable, cheap from an economic point of view and high livestock palatability, a fairly high source of carbohydrates and protein. By giving Moringa oleifera leaves, the nutritional balance in the livestock body will be fulfilled so that it will affect the growth of livestock body weight. [3] reported that the leaves of Moringa oleifera (Moringa oleifera) have a high protein content, complete essential amino acids, complete vitamins and complex mineral content. [4] stated that Moringa oleifera leaves contain high nutrients, namely protein (28.44%), carbohydrates (57.01%), ash (7.95%), fat (2.74%), and fiber (12.63%). Based on this description, this researcher try to investigate the effect of giving fermented cow faeces on the growth of Moringa oleifera plants.

2. Materials and Methods

2.1. Materials

The material used was the two weeks old Moringa Oleifera, fermented cow stool as a treatment, water for watering the plants at the time of the research and as a treatment to dissolve fermented cow feces, as well as other materials that support the research.

2.2 Tools

The tools used were twenty 5 kg polybags as a growing medium for Moringa oleifera plants, hoes to provide land, cheerful to water plants, measuring cloth meters or rollers to measure plant height, calipers to measure stem diameter.

2.3 Methods

The experimental design used was a completely randomized design (CRD) of 4 treatments and 5 replications. The treatments that will be used in this research were:

P0 = Control (not given fertilizer)

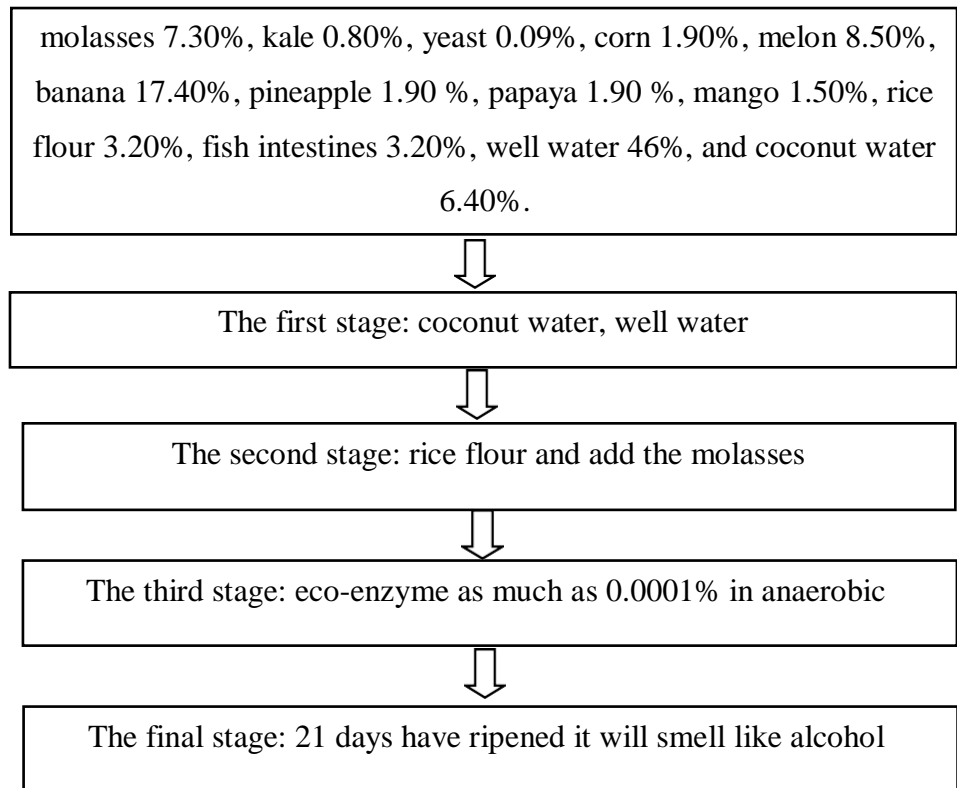
P1 = Given fermented cow stool 5 ml/polybag

P2= Given fermented cow stool 10 ml/polybag

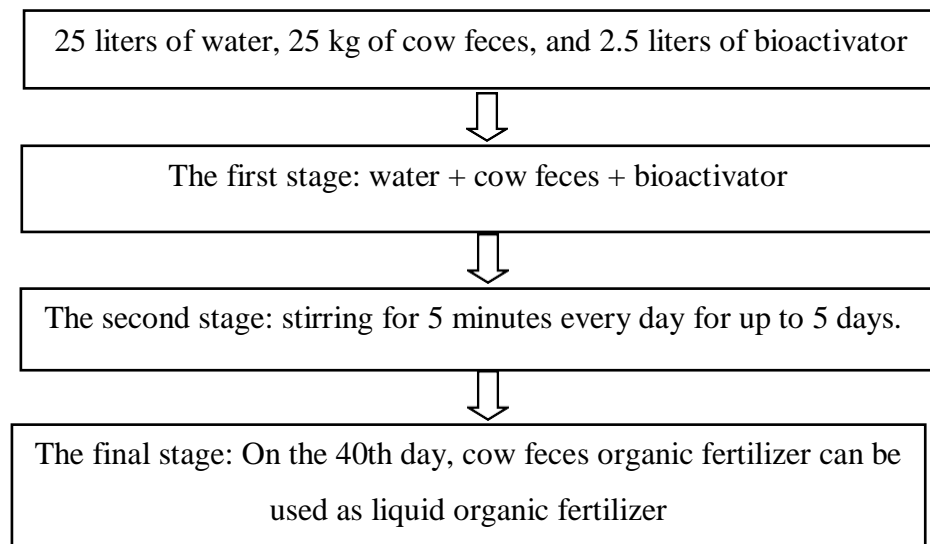
P3 = Given fermented cow stool 15 ml/polybag

2.4 Research Implementation

2.4.1 Making Liquid Organic Fertilizer



2.4.2 Making Fermented Cow Stool



2.4.3 Selection of moringa seeds

2.4.4 Media preparation

2.4.5 Planting

2.4.6 Fertilizing

2.4.7 Plant maintenance

2.4.8 Taking data

2.5 Parameters observed

2.5.1 Plant height

2.5.2 Number of stem branches

2.5.3 Number of leaves

2.5.4 Leaf width

2.5.5 Stem diameter

3. Discussion Results

3.1 Plant height

The results of research on fermented cow stool on the growth of *Moringa oleifera* can be seen in the following "Table 1".

Table 1. Plant height (cm) *Moringa oleifera* application of fermented cow feces

Treatments	Repetition					Average
	U1	U2	U3	U4	U5	
P ₀	145.00	144.00	138.00	131.00	141.00	139.80 ^c
P ₁	183.00	161.00	172.00	167.00	171.00	170.80 ^a
P ₂	163.00	157.00	150.00	150.00	141.00	152.20 ^b
P ₃	155.00	150.00	140.00	150.00	139.00	146.80 ^{bc}

Note : Different letters in the same column indicate very significant differences (P<0.01)

The results of this research that the growth of *Moringa oleifera* plants using fermented cow feces had a significant effect. It was assumed that giving fermented cow feces can increase the growth of *Moringa oleifera* plants, because of its easy absorption by plants and made from organic which organic materials can increase growth, especially at plant height. The results of laboratory analysis of fermented cow feces analyzed at the Laboratory of the Faculty of Agriculture, University of North Sumatra contained N (1.09%), P (9.21%), K (1.40 ppm), and C-Organic (2.03%). This was in accordance with the statement [5] which stated that high growth in plants was a physiological process in which division occurs in plant cells. In the process of division, the plant requires sufficient essential nutrients which will be absorbed through the plant roots.

The results of the study showed that in the P3 treatment there was a decreased growth value, caused by excessive application of fertilizer thus caused growth

disturbance. This was in accordance with statement [6] which stated that the higher the concentration of organic fertilizers given, it will affect the growth of plant height because the nutrient content contained in fertilizers was also higher.

3.2 Number of stem branches

The results of research on fermented cow stool on the growth of *Moringa oleifera* can be seen in the following “Table 2”.

Table 2. Number of stem branches *Moringa oleifera* application of fermented cow feces

Treatments	Repetition					Average
	U1	U2	U3	U4	U5	
P ₀	129.00	153.00	172.00	160.00	153.00	153.40 ^b
P ₁	198.00	176.00	203.00	187.00	265.00	205.80 ^a
P ₂	162.00	162.00	207.00	225.00	180.00	187.20 ^{ab}
P ₃	146.00	174.00	174.00	169.00	155.00	163.20 ^b

Note : Different same letter in the same column show not significant difference ($P > 0.05$)

The results showed that the application of fermented cow feces liquid organic fertilizer not significant effect on the increase in the number of branches of the *Moringa oleifera* plant.

In “Table 2”, it can be seen that the provision of fermented cow feces increased the number of branches of the *Moringa oleifera* plant stem due to several factors including the availability of nutrients and the intensity of sunlight. The availability of P (Phosphorus) in fertilization can increase shoot growth in *Moringa oleifera*, where the phosphorus content in the liquid organic fertilizer for fermented cow feces after analysis was 9.21%. This was in accordance with [7] statement which states that the element P was involved in various biosynthetic processes in plants such as photosynthesis, protein synthesis, and almost all aspects of growth and metabolism in plants. P elements in appropriate doses can trigger cell division and multiplication, thereby increasing the rate of emergence and growth of shoots. In the planting area of *Moringa oleifera* plants, get good sunlight intensity on the research area so that it can improve overall plant growth well. This was in accordance with the statement [8] which states that full sunlight on the land causes an increase in the rate of photosynthesis which was supported by the presence of abundant P elements in the soil. So that it can accelerate the rate of formation and growth of *Moringa oleifera* shoots. Nutrients that were available and derived from liquid organic fertilizers affect the vegetative growth of plants, one of which was the addition of branches in plants that function as the emergence of ovules and cause an increase in the number of plant fruits. Sufficient nutrients will help plants in the process of photosynthetic rate which affects the increasing number of stem and pod branches produced by plants [9].

3.3 Number of leaves

The results of research on fermented cow stool on the growth of *Moringa oleifera* can be seen in the following “Table 3”.

Table 3. Number of leaves *Moringa oleifera* application of fermented cow feces

Treatments	Repetition					Average
	U1	U2	U3	U4	U5	
P ₀	2,900.00	5,018.00	4,311.00	3,817.00	3,991.00	4,007.40 ^c
P ₁	5,504.00	6,586.00	6,045.00	8,934.00	9,137.00	7,241.20 ^a
P ₂	4,914.00	4,878.00	8,881.00	7,497.00	4,694.00	6,172.80 ^{ab}
P ₃	4,260.00	4,523.00	7,432.00	3,709.00	5,375.00	5,059.80 ^{bc}

Note : Different superscripts in the same column show not significant ($P > 0.05$)

In the formation of *Moringa oleifera* leaves, it cannot be separated from the presence of nutrients, such as nitrogen and phosphorus which were available in the plant itself. Nitrogen and phosphorus nutrients function in the process of forming new cells and as the main components of organic compounds in plants that will affect vegetative growth, especially the increase in the number of leaves. Apart from the elements N and P, plants also need other elements, namely the element potassium. This was in accordance with the statement [10] which states that the element of potassium plays a role in regulating the movement of stomata so that it will help increase the number of leaves on plants. Elemental K acts as an activator for enzymes needed in the process of photosynthesis and respiration. Elemental K also acts as a source of strength for plants to reduce the effects of drought and fight disease. Plants that were deficient in K will cause the leaves to shrink, especially the old ones.

3.4 Leaf width

The results of research on fermented cow stool on the growth of *Moringa oleifera* can be seen in the following “Table 4”.

Table 4. Leaf width (cm) *moringa oleifera* application of fermented cow feces

Treatments	Repetition					Average
	U1	U2	U3	U4	U5	
P ₀	0.50	0.40	0.40	0.20	0.30	0.36 ^b
P ₁	0.60	0.70	0.80	0.80	0.80	0.74 ^a
P ₂	0.70	0.60	0.60	0.50	0.40	0.56 ^b
P ₃	0.50	0.30	0.40	0.40	0.40	0.40 ^b

Note : Different superscripts in the same column show very significant differences ($P < 0.01$)

The results showed that giving fermented cow feces had a very significant effect on the leaf width growth of *Moringa oleifera*.

The results of the study in “Table 4”. It can be seen that the good leaf width growth in treatment P1. This was in accordance with the research of [11] on giving 5 ml POC treatment to have a better leaf area, thus the photosynthesis process will run more

smoothly, so that the photosynthetic pile will also be more. So that plants will more easily absorb nutrients from the soil even in drought conditions.

The results can be seen in “Table 4”. It was known that fermented cow feces affected leaf width. It can be seen that the best treatment was at the 5 ml doses. In the 5 ml treatment there was a good nutrient content of liquid organic fertilizer. Apart from nutrients, the intensity of sunlight also affects the growth of leaf width. In this study, light intensity measurements were not carried out due to limited tools, but in the research area there were no tall trees covering *Moringa oleifera* plants so that the plants could be exposed to sunlight evenly. This was in accordance with the statement of [12] which states that light intensity was the amount of energy received by plants per unit time and broad unity. Light intensity will affect plant morphology because light was needed in the photosynthesis process to produce carbohydrates.

3.5 Stem diameter

The results of research on fermented cow stool on the growth of *Moringa oleifera* can be seen in the following “Table 5”.

Table 5. Stem diameter (mm) *moringa oleifera* application of fermented cow feces

Treatments	Repetition					Average
	U1	U2	U3	U4	U5	
P ₀	12.50	12.60	14.40	16.70	14.40	14.12 ^c
P ₁	22.40	18.30	22.60	20.20	20.30	20.76 ^a
P ₂	17.60	15.90	18.20	17.60	17.60	17.38 ^b
P ₃	14.00	15.30	17.50	15.50	16.70	15.80 ^{bc}

Note : Different superscripts in the same column show significant differences (P<0.01)

Results showed that the P1 treatment had the best value for the increase in stem diameter growth of *Moringa* plants. Based on the results of analysis of variance, it shows that the application of fermented cow feces fertilizer at different doses can have an effect on the growth of the stem diameter of *Moringa* plants. Treatment P1 was significantly different in treatment P2, P3 was significantly different in treatment P0. It was suspected that there was a balance between the nutrients contained in each treatment for the growth needs of the *Moringa* plant stem diameter. This was in accordance with the statement of [13] which states that nitrogen was one of the elements most needed by plants. Nitrogen had an important role in the growth of plant stem diameter. Nitrogen plays a role in spurring the growth and development of shoots, leaves and fruit production. Nitrogen plays a role as a basic component in the synthesis of proteins, enzymes, amino acids, nucleic acids, and an integral part of chlorophyll which also plays a role in controlling all metabolic reactions in plants. An increase in the diameter of the stem can occur if there was an increase in the nutrient content of the crown growth. The increase in the diameter

of the plant stems can occur when the photosynthesis products were distributed to the crown area.

4. Conclusion

Based on the results of the study, it was concluded that the application of fermented cow feces organic fertilizer showed a significant effect on growth (increase in plant height, leaf width, and stem diameter) of *Moringa oleifera* plants by using liquid fermented cow feces at a dose of 5 ml / polybag.

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