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Utilization of Buffalo Faeces Combination of Fermented Coffee Peel with MOL (Local Microorganisms) Against Growth of *Indigofera zollingeriana*

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Abstract. The aim of this study was to examine the effect of organic buffalo faeces organic fertilizer combination of fermented coffee peel on *Indigofera zollingeriana* plant growth. This research was conducted in Parlondut Village, Pangururan District, Samosir Regency, North Sumatra from March to May 2019. The design used in this study was a completely randomized design with 4 treatments. T_0 = no buffalo feces without coffee peel combination; T_1 = faeces buffalo coffee peel combination 200g; T_2 = faeces buffalo coffee peel combination 400g; and T_3 = faeces buffalo coffee peel combination 600g. Variables observed were plant height, number of leaves, number of branches, stem diameter, and width of leaves.The results showed that the administration of coffee peel buffalo feces combination had a very significant influence on research parameters increasing,i.e plant height, number of leaves, number of branches, stem diameter, leaf width of *Indigofera zollingeriana* plants. The conclusion of this research is that increasing fertilizer dosage by using buffalo faeces combination of coffee peel on *Indigofera zollingeriana* plant can increase plant growth.

Keywords : *indigofera zollingeriana*, coffee peel, buffalo faeces, organic fertilizer

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Introductions

Samosir Regency has potential waste from agricultural products and livestock waste that can be made as organic fertilizer that can be used for agricultural land. Coffee peel and livestock feces as one of the wastes that are very easy to find in Samosir. In some villages in Samosir District, coffee peel waste is often thrown away or piled up in an empty land near residents, without any residents taking the initiative to utilize or treat coffee waste as a good fertilizer for plants.

Coffee waste is one example of organic fertilizer. Coffee peel waste has organic material and nutrients that make it possible to improve the nature of buffalo faeces soil very easily obtained in Samosir Regency. The use of buffalo faeces in addition to being a source of organic material can also increase the availability of nutrients for *Indigofera zollingeriana* plants. This forage plays an important role in developing livestock business. The procurement of forage needs to be managed

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properly. The goal of forage management is forage forages including tree legumes such as *Indigofera zollingeriana* [1]. *Indigofera sp*. very well utilized as forage in Samosir District considering Samosir climate conditions tolerant of the dry season, resistant to salinity and *Indigofera sp* have high nutritional quality, 27.9% crude protein, 27.9% crude fiber, 15.25% crude fiber, 0.22% calcium and phosphorus 0.18% [2]. This research investigated combination of waste which are abundant and left over on the environment become a new kind of fertilizer and be used on *Indigofera zollingeriana* which are new kind of tree legume for the livestock breeders in Samosir island.

Research and Methods

Research Location and Time

The study was conducted in the village of the Parlondut Pangururan District, Samosir Regency, North Sumatera. The research took place from March until May 2019.

Research methods

The experimental design used was a completely randomized design (CRD). The treatments used in this study were:

T0 = Not given organic fertilizer combination of buffalo faeces with coffee peel

T_1 = Organic fertilizer combination of buffalo faeces with coffee peel 200g /plot

T_2 = Organic fertilizer combination of buffalo faeces with coffee peel 400g /plot

T3 = Organic fertilizer combination of buffalo faeces with coffee peel 600g/plot

Where each treatment was repeated 6 times. Then the combination of treatments is:

T_1	T_2	T_0	T_3	T_2	T_1
T_3	T_1	T_2	T_0	T_3	T_2
T_0	T_3	T_1	T_2	T_1	T_0
T_2	T_0	T_3	T_1	T_0	T_3
U1	U2	U3	U4	U5	U6

Figure 3. Schematic of the research area

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Information:

Plot size = 1 x 1 m

Plant spacing: 2 x 2 m

The experimental mathematical model used is a Completely Randomized Design (CRD) with the following design models:

$$\mathbf{Yij = \mu + \delta i + C\ ij}$$

Information:

i = 1,2,3, ... treatment

j = 1,2,3, ... replicates

Yij = Observation value from the i treatment and the j replication

Cij = The effect of randomization on the i treatment and the j test

μ = Middle age value

δi = effect of the i treatment

2.3 Data analysis

The data obtained will be analyzed, and if the treatment is significantly different ($F \geq 0.5$) or very real ($F \geq 0.1$) then it is further tested using the Duncan test.

Research Parameters

a. Plant Height

Plants were measured to get high plant values from each treatment. Plant height is measured from ground level to the highest part of the Indigofera zollingeriana plant.

b. Number of Leaves

The number of leaves is obtained by counting all the leaves that have been fully opened in each plant from each treatment at intervals once a month.

c. Number of Branches

The number of branches is obtained by counting all branches that appear on each plant from each treatment.

d. Rod Diameter

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Stem diameters were measured before harvesting using calipers. Stem diameter measurements were carried out 10 cm above the ground by clamping the stem of the plant with calipers. Then the measuring lever is shifted until it does not move anymore and visible numbers on the calipers.

e. Leaf Width

Plants measured the width of the leaf by using a meter or ruler. Measurements were made on the widest leaves in each treatment

Results and Discussion

Plant Height

Table 1. Average plant height (cm) of Indigofera zollingeriana

Average	Replicates						Treatments
	U1	U2	U3	U4	U5	U6	
$T_0$0 g	46,67	41,00	36,33	49,67	40,67	45,67	43,335[a]
$T_1$200 g	48,00	46,33	49,33	51,00	46,00	47,67	48,055[b]
$T_2$400 g	45,67	46,67	49,00	49,00	46,67	55,33	48,723[b]
$T_3$600 g	51,33	54,33	56,00	49,33	51,67	56,33	53,165[c]

Note: Different superscriptions in the same row or column show a real difference in the Duncan test ($p < 0.05$).

Based on the results in Table 1, the administration of buffalo feces combined with fermented coffee peel MOL with banana weevil has an effect on plant height of *Indigofera zollingeriana*, where the highest average height of *Indigofera zollingeriana* plant is found in T_3 (600g/stem), which is 53.17 cm and lowest in T_0 (without the use of buffalo feces organic fertilizer combined with coffee peel) is 43.34 cm. At the level of 5% the effect of organic buffalo feces organic fertilizer combination on coffee peel growth on the growth of Indigofera zollingeriana showed that the distance between T_0 (without buffalo feces combination with coffee peel) with T_1 (200g/stem) indicated that the distance of plant height between both are significantly different. In addition, T_2 (400g/stem) and T_3 (600g/stem) indicated that the distance between plant height is significantly different, whereas in T_1 and T_2 with a dose of organic fertilizer 200g/stem and 400g/stem showed no significant difference in the Duncan test. This is consistent with [3], who offered a dose of organic fertilizer 600g/plant provides the best effect on the height of mahogany seedlings. The higher dose of manure given will trigger an increase in plant height. This is in line with the findings [4] by giving a dose of organic fertilizer 18.5 tons/ha gives the best effect on the height of strawberry plants.

Number of Leaves

Table 2. Average number of leaves of Indigofera zollingeriaa

Average	Replicates	Treatments

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	U1	U2	U3	U4	U5	U6	
$T_0$0 g	104,67	120,33	127,33	135,33	125,67	172,33	130,943[a]
$T_1$200 g	173,67	155,33	164	169,33	153,67	244,67	176,778[b]
$T_2$400 g	190	188,33	234,33	191,33	212,67	213,67	205,055[c]
T_3 600 g	218,67	215,33	247,33	254,67	244,33	274,67	242,500[d]

Note: Different superscriptions in the same row or column show a real difference in the Duncan test ($p < 0.05$).

Based on the results in Table 2 that administration of buffalo faeces combination of coffee peel influences the number of leaves of *Indigofera zollingeriana*, where the mean of the largest number of daunter is on the T_3 (600g/stem) which is 242.50 and the lowest is on T_0 (without administration of buffalo faeces combination of coffee peel) which is 130.94. At the level of 5% the effect of organic buffalo feces organic fertilizer combination on coffee peel growth on the growth of *Indigofera zollingeriana* showed that the distance between T_0 (without buffalo feces combination with coffee peel combination) with T_1 (200g/stem) indicated that the distance influence the number of leaves between both are significantly different. It can also be seen that at T_2 (400g/stem) and T_3 (600g/stem) showed that the distance of influence between the number of leaves is significantly different. The application of buffalo feces organic fertilizer on the combination peel of copied showed significantly different results between treatments on the growth of the number of leaves of *Indigofera zollingeriana.*

Nutrients contained in buffalo feces organic fertilizer combined with coffee peel-fermented with MOL (local microorganisms) banana weevil is more quickly available and absorbed for plants. The addition of organic fertilizer can increase the number of leaves in Indigofera sp. This can be seen in Table 2 showed the highest number of leaves in T_3 at a dose of 600g/stem with an average of 242.50 or the equivalent of 18 tons/ha/ year of fertilization. This is in accordance with [5], who reported the provision of organic fertilizer from coffee peel waste 15 tons/ha to 20 tons/ha can improve the quality of the growing medium so that it can increase the growth of the number of leaves on rubber plant seeds.

Number of Branches

Table 3. The average number of branches of *Indigofera zollingeriana*

Average	Replicates						Treatment
	U1	U2	U3	U4	U5	U6	
$T_0$0 g	7,67	6,67	6,33	11	8	10	8,278[a]
$T_1$200 g	9,33	7	11,33	8,67	12,33	10,67	9,888[b]
$T_2$400 g	10,33	13,67	9,67	15	13	11,67	12,223[b]
$T_3$600 g	12,67	16,67	12,33	15,33	15	17	14,833[c]

Note: Different superscriptions in the same row or column show a real difference in the Duncan test ($p < 0.05$).

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Based on the results in Table 3 showed that the buffalo feces combination of coffee peel combination influences the growth of Indigofera zollingeriana branches, where the largest average number of branches is in the T_3 (buffalo feces combination of 600g of coffee peel) that is 14.83 and the lowest is in T_0 (without administration of buffalo feces combination coffee peel) that is 8.28.

At the 5% level the effect of organic buffalo feces organic fertilizer combination on the growth of *Indigofera zollingeriana* showed that the distance between T_0 (without buffalo feces combination with coffee peel) with T_1 (200g/stem) indicated that the distance influence the number of branches between both is significantly different. It can be seen that T_2 (400gm/stem) and T_3 (600g/stem) showed that the distance of influence of the number of branches is significantly different. The application of organic fertilizer on T_1 (200g/stem) and T_2 (400g/stem) showed no significant difference in the Duncan test. The provision of organic fertilizer for buffalo feces in combination with coffee peel can increase the growth of *Indigofera zollingeriana* branches due to several factors including nutrient availability and sunlight intensity. High availability of phosphorus (P) at 600g/stem fertilizer can increase shoot growth in *Indigofera zollingeriana* plants, where the P content in organic fertilizer of buffalo feces combined with coffee peel after the analysis is 0.28.

Rod Diameter

Table 4. Average stem diameters of Indigofera zollingeriana

Average	Replicates						Treatments
	U1	U2	U3	U4	U5	U6	
$T_0$0 g	4,33	3,67	3,67	4,33	5,33	4,33	4,276[a]
$T_1$200 g	4	4,33	5	5,33	4,33	4,33	4,553[a]
$T_2$400 g	5	5,33	6	6	4,67	5,33	5,388[b]
$T_3$600 g	5,33	5,33	5,67	6	5	6	5,555[b]

Note: Different superscriptions in the same row or column show a real difference in the Duncan test ($p < 0.05$).

Based on the results in Table 4 showed that the administration of buffalo faeces combination of coffee peel affects the stem diameter of the *Indigofera zollingeriana* plant, where the largest average stem diameter is in the treatment of T_3 (buffalo feces combination of 600g coffee peel) is 5.55 mm and the lowest is on T_0 (without buffalo faeces combination of coffee peels) is 4,27 mm.

At the level of 5% the effect of organic buffalo feces organic fertilizer combination on coffee peel growth on the growth of Indigofera zollingeriana showed that the distance between T_0 (without buffalo feces combination with coffee peel) with T_1 (200g/stem) with the same letter indicates that the distance influence the stem diameter between the two are not significantly different but are significantly different in T_2 and T_3. It can also be seen that at T_2 (400g/stem) and P T_3 (600g/stem) indicated that the distance of influence of the diameter of the stem between the two is not significantly different in the Duncan Test. The application of buffalo feces organic fertilizer, a combination of coffee peels with different dosage fertilizers, showed a significant effect on the diameter of the stem of the plant. The application of 600g/stem of organic fertilizer showed the highest yield of 5.55 mm.

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This is in accordance with [6], who reported that the provision of organic fertilizer in Indigofera sp. plants with a fertilizer dosage of 500g/stem is 13.38 mm with 1000g/stem, i.e. 15.68 showed significantly different results on stem diameter in Indigofera sp. The higher the level of fertilizer fertilization in plants will increase the growth of stem diameter in plants.

Leaf Width

Table 5. Flat leaf width of Indigofera zollingeriana

Average	Replicates						Treatments
	U1	U2	U3	U4	U5	U6	
$T_0$0 g	2,87	2,87	2,93	2,83	2,97	2,8	2,878[a]
$T_1$200 g	2,83	3	2,8	3,1	2,97	3,1	2,967[a]
$T_2$400 g	3,17	3,17	2,97	3,03	3,17	3,1	3,101[b]
$T_3$600 g	3,3	3,23	3,33	3,27	3,07	3,47	3,278[c]

Note: Different superscriptions in the same row or column show a real difference in the Duncan test ($p < 0.05$).

Based on the results Table 5 showed that the administration of buffalo faeces combination of coffee peel effect on the growth of leaf width of Indigofera zollingeriana, where the average width of the dauntless is found in the treatment of T_3 (600g/stem) that is 3.27 cm and the lowest in T_0 (without the administration of buffalo feces combination) 2.88 cm.

At the 5% level the effect of applying buffalo feces organic fertilizer in combination of coffee peel on the growth of Indigofera zollingeriana showed that the distance between T_0 (without buffalo faeces combination of coffee peel) with T_1 (200g/stem) indicated that the distance influence of leaf width between the two are not significantly different. This is presumably because the nutrient content of 200g organic fertilizer in plants is not sufficient when nutrient absorption in organic fertilizer is seen in the leaf width parameter. It can also be seen that at T_2 (400 gram/stem) and T_3 (600g/stem) indicated that the distance of influence of leaf width between the two is not significantly different in the Duncan test. The application of buffalo feces organic fertilizer combined with fermented coffee peel with MOL (local microorganism) banana weevil on Indigofera zollingeriana plant can increase the growth of leaf size. The highest leaf width in T_3 (600g/stem) with an average of 3,278 or equivalent fertilizing 18 tons/ha/year followed by T_0 (400g/stem) with an average of 3,101. This is accordance with [4], who reported the provision of organic fertilizer coffee peel waste in rubber plants 15 tons/ha can produce leaf area increase.

Conclusion

Utilization of buffalo feces organic fertilizer combined with coffee peel fermented with MOL (local microorganisms) by administering 600g/stem, can increase plant growth and provide the best growth in parameters (plant height, number of leaves, number of branches, number of stems, stem diameter, leaf width) on Indigofera zollingeriana plant.

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