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Assessment of the Effect of Chicken Dung on the Growth of Mulberry *(Morus Alba)*

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Abstract— *Chicken manure has a high concentration of macro-nutrients, a significant increase of nitrogen and phosphorus, cation exchange capacity (CEC), and the total exchangeable bases. The study was conducted to determine the effect of chicken dung on the growth of Morus Alba (Mulberry. S in Lamitan city, Basilan, Philippines. The Randomized Complete Block Design (RCBD) was laid out in a single factor using SAS version 9.0 and Fisher's LSD test for mean comparison. There are four treatments application such as control, 15 grams, 50 grams, and 100 grams. Data collected starts from 15, 30, 45, and 60 DAT. There were significant results in height at 100 grams level of chicken dung application. However, it also reveals non-significance in terms of the number of leaves and leaf area index but observing the means it showed as the chicken dung application increases of these two indicators also increases. For cumulative measurement, the trend was increased from T1 to T4 in all parameters. Likewise, the moisture contents, fresh weight, and dry matter content are inclining in all blocks. Therefore, the application of chicken dung has a positive response to the growth of mulberry.*

I. INTRODUCTION

Plants play a critical part in keeping mother nature under constant stage by diminishing the worldwide warming through take-up of carbon dioxide from the environment and in return create and discharge oxygen into the surroundings; which decontaminates the discuss and give life to animals and other living beings. Plants to contribute to soil wellbeing; hold water in soil sub-surface and cold overheated urban ranges through its evapotranspiration instrument of the water cycle (Katul and Novick, 2009; Rohela et al., 2020). Mulberry (Morus spp.; Family- Moraceae) is broadly distributed in the mild, subtropical, or tropical parts of the world and can develop in a broad extend of climatic, land, and soil conditions (Hosseini et al., 2018; Krishna et al., 2020; Tao et al., 2016). It is a lasting woody plant and shapes the fundamental nourishment fabric for silkworms (Pan and Lou, 2008; Kurniati et al., 2014). It utilizes as a medicinal plant for fever treatment and liver security and a remedy for physical and mental ailments, basically based on convictions coming about from observational hone, which can also be devoured as nourishment by patients with diabetes mellitus. It used for centuries in Chinese pharmaceutical and, more as of late, around the world, counting in Brazil (Zeni and Dall'Molin, 2010; Singh et al., 2013; Oliveira et al., 2016).

Aside from being the sole nourishment plant, mulberry has been used for catering to diversified needs such as feed, fuel, and fiber. The ethnobotanical utilization of mulberry includes utilization of ready natural products, which are exceedingly acknowledged for their tasty taste and are consumed either new or after extraction of juice (Krishna et al., 2020). Customarily, mulberry takes off are dried out by sun drying. Another drying innovation is hot-air convective drying. (Tao et al., 2016). In mulberry development, chemical fertilizers are used to preserve and improve the progress and leaf quality (Datta et al., 2002). Be that as it may, visit utilize of chemical fertilizers for a delayed period falls apart the surface soil characteristics and influences the accessibility and take-up of supplements to plants (Subbaswamy et al., 1994). The expansion of nitrogen fixers can enhance and improve the supplement esteem of any compost and encourage supplementation or substitution of chemical fertilizers (Espiritu et al.,1995). Plants require well-balanced nourishment for way better development and abdicate. Fertilizers are the substances that give supplements for the legitimate progress of plants. Organic fertilizer has been included in the soil to extend its richness and improve plant development. The application of excrements to soil gives potential benefits counting making strides the ripeness, structure, water holding capacity, expanding soil organic matter. Subsequently, diminishing the sum of engineered fertilizer required for trim generation (Blay et al., 2002). Fertilizer within the shape of deteriorated bovine waste has been used with success. Organic matters contain changing sums of water, mineral supplements, organic matter (Edwards and Daniel, 1992; Brady and Weil, 1996). The utilizes of natural squanders as excrement has been in practice for centuries worldwide (Straub, 1977) and within the later times (Omiti et al., 1999; Clay et al., 2002; Gambara et al., 2002; López-Masquera et al., 2008). There still exists an ought to survey the potential impacts of chicken excrement on soil chemical properties and trim abdicate and in specific assessing the basic application levels. In addition, the utilization of chicken fertilizer has surpassed the utilize of another creature excrement such as pig manure and kraal fertilizer since of its tall substance of nitrogen, phosphorus, and potassium. It was expected that the cation trade capacity (CEC), the overall replaceable bases, and the significant increase of nitrogen and phosphorus were picked up taking after the expansion of chicken fertilizer (Dikinya & Mufwanzala, 2010). On the other hand, the tall pH of chicken excrement will enormously impact the nitrification quickly or after a slack stage after the application, causing the misfortune of $N\text{-}NO_3$ beneath the favorable condition (Ogink, 2005; Pujiastuti et al., 2018).

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Among the mulberry species, a few are proficiently utilized for phytoremediation of soil sullied with pesticides, chemical fertilizers or overwhelming metals (Hashemi and Tabibian, 2018); a few species are efficiently utilized in evacuation of dangerous substances from discuss and water (Raskin and Ensley, 2000); a few are utilized for Eco-restoration and soil preservation (Shi et al., 2005); a few species are being utilized in economy era and other species are abused for the advancement of human wellbeing (Del et al., 2013). Therefore, this research study is aim to establish the effect of different levels of chicken dung on the growth and development of mulberry, specifically to determine the height and height increment, leaves production, leaf area index, and dry matter content of mulberry leaves.

II. Materials and Methods

2.1 The Study Sites

The study was conducted from September 2020 to November 2020 at the Basilan State College, College of Agriculture and Fisheries, Santa Clara Campus, Lamitan City, Basilan, Philippines ($60^0$40'52.24" N, $122^0$03'40" E). The area has a type III climate classification, where the seasons are not very pronounced, relatively dry from November to April, and wet during the rest of the year. Almost the entire area consists of Bulawan clay loam is (Bangsamoro Development Agency, 2016). The annual mean temperature and precipitation are 26.6^0C and 1,100 mm, respectively (Bangsamoro Development Agency, 2016; Jalil et al., 2021).

2.2. Experimental Design and Materials

The experimental area was laid out in a randomized complete block design (RCBD) with four treatments, replicated three times. Twenty plastic bottles of 1.5 liters installed 12 plots as improvised drip irrigation, two plastic bottles for each. The plastic bottles are in a standing position and buried 9 inches below the ground. Each 1.5 li water-filled bottle is fully drained or consumed for up to 3 days. The chicken dung was applied using the basal method before transplanting, and the side dressing of chicken dung was performed 30 and 60 days after transplanting. The application was done equally to all treatments based on rate and time and only varied on the amount of chicken dung application per treatment. Preparation of cuttings of Mulberry, cuttings prepared from well-matured 6-8 months old shoots of about 1.5 cm diameters. Cuttings of 15-20 cm length with 3-4 healthy buds selected from the plantation. The mulberry cuttings were transplanted at a depth of 30-40 cm when they reached six months old ideally, at the spacing of 1.0 by 1.0 meters, and the soil pulverized well.

2.3. Sampling and Measurements

The average height of mulberry was taken by measuring all individual plants using the meter stick measured from the ground to the apical tip of the plant. The sum of plants' height is divided by the number of plants used in getting the average. The number of leaves of mulberry was measured by counting the total number for each plant, then summing up all plant leaves and dividing them by the total number of plants, similar to a method for taking average height. For leaf area index (LAI); was computed using the equation, LAI = w x l x 0.69 (Singhal & Bindroo, 2003), where w and l are the width and length of mulberry leaf, respectively. The plant heights and number of leaves were measured at the end of 60 DAT.

The height increment was measured at every 15, 30, 45, and 60 DAT (days after transplanting) and was based on the average increment. After 60 DAT, all leaves of mulberry plants were harvested and dried for continuous three days of sun drying. The process was made to compute the percent moisture and dry matter contents using the formula %MCwb = (FW-DW)/FW*100, where FW and DW are fresh and dry weight, respectively. The collection of data started at 15 DAT.

2.4. Statistical Data Analysis

The experimental area was laid out in a Randomized Complete Block Design (RCBD) with eight treatments replicated three times. The data were subjected to analysis of variance procedures appropriate for 1 factor in randomized complete block design using SAS version 9.0. Fisher's LSD Test was used for mean comparison.

III. Results and Discussion

A. Height of mulberry

The average height (Table 1) as affected by different levels of Chicken Dung measured in centimeters per hill per plot. The highest mean obtained by T4 at 24.83 cm tall is the application of 100 grams of chicken dung compared to T1 and T2. Furthermore, the T3 was next to T4 with a mean of 23.66 cm, and T2 obtained the same as T1 at 20.66 cm. As per the results of the analysis of variance, blocking was effective and, there was a significant difference at (alpha 0.05) among the treatment means. The LSD was applied to find out the differences among the means. It found out that the T4 was different from treatment T1 and T2, which means the 100 grams of chicken dung application was far better than the 15 grams application and control. However, T4 has no significant difference from T3, and T4 could enhance by adding more grams of chicken dung. Hence, when the chicken dung increases its volume, the height is also increasing.

The results were significant since the P-value of 0.0815 is less than the F-value of 3.69. It emphasizes that at least one level of chicken dung application affects the average height of mulberry.

TABLE 1. Average height of Mulberry

Treatment	Replication			Total	Mean
	I	II	III		
0	20.5	20.5	21	62	20.66 a
15	20.5	20.5	21	62	20.66 a
50	21.5	24.5	25	71	23.66 ab
100	22	23	29.5	74.5	24.83 b
Block Total	84.5	88.5	96.5		
Grand Total				269.5	
GrandMean					22.45
Significance *					

ns-None Significant, *-Significant, **-Highly Significant
Means with the same letter are none significantly difference.
CV = 8.53
LSD = 3.83

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B. Number of Leave

Table 2 below shows, T4 obtained the highest number of leaves with the mean of 24 leaves per hill per plot compared to the control, followed by T3 at 21.5, then T2 at 19.79, respectively. The minimal number of leaves was obtained by treatment (T1) with a mean of 18.88. The analysis of variance has resulted in effective blocking but no significant differences in terms of treatment, which means that adding 15 grams, either 50 or 100 grams of chicken dung, does not affect the number of leaves of mulberry. Furthermore, as the application of chicken dung increases, the number of leaves also increases. In other words, the result could enhance by increasing the volume of chicken dung up to 150 grams per hill, or maybe the chicken dung could only affect the height of the mulberry and not the number of leaves.

TABLE 2. Average Number of leaves of Mulberry

Treatment	Replication			Total	Mean
	I	II	III		
0	14	18.13	24.50	56.63	18.88a
15	18.25	18.88	22.25	59.38	19.79a
50	24.75	13.75	26.00	64.50	21.50a
100	16.75	25	23.25	65	21.67a
Block Total	73.75	75.75	96.00		
Grand Total				245.50	
GrandMean					20.46
Significance: ns					

ns-None Significant, *-Significant, **-Highly Significant
Means with the same letter are none significantly difference.
CV = 21.69
LSD = 8.87

C. Leaf Area Index (LAI)

The leaf area index (Table 3) showed that T4 has the highest mean of 39.09 cm^2, followed by T3 at 38.56 cm^2, then T2 at 38.06 cm^2, the lowest was obtained by T1 at 35.56 cm^2. Moreover, the analysis of variance resulted in effective blocking, which means that the area and the position of the blocking were effective to avoid bias. But it resulted in no significant differences among treatment means similar to the result of the number of leaves, which mean applying from 0 – 100 grams level of chicken dung have differences. However, the numbers indicate that the application of 100 grams of chicken dung was far from the 0, 15, and 50-grams level of chicken dung. It indicated that as the application of chicken dung increases, the leaf area index of mulberry is also increasing. It is possible to achieve a significant result on treatment by adding more chicken dung. This LAIs were measured 60 days after transplanting (DAT).

TABLE 3. Leaf area index (LAI) of Mulberry

Treatment	Replication			Total	Mean
	I	II	III		
0	22.33	36.41	47.94	106.69	35.56a
15	30.82	39.19	44.17	114.19	38.06a
50	29.57	49.87	36.24	115.67	38.56a
100	31.63	44.14	41.49	117.26	39.09a
Block Total	114.35	169.61	169.84		
Grand Total				453.8	
GrandMean					37.82
Significance: ns					

ns-None Significant, *-Significant, **-Highly Significant
Means with the same letter are none significantly difference.
CV = 15.64
LSD = 11.82

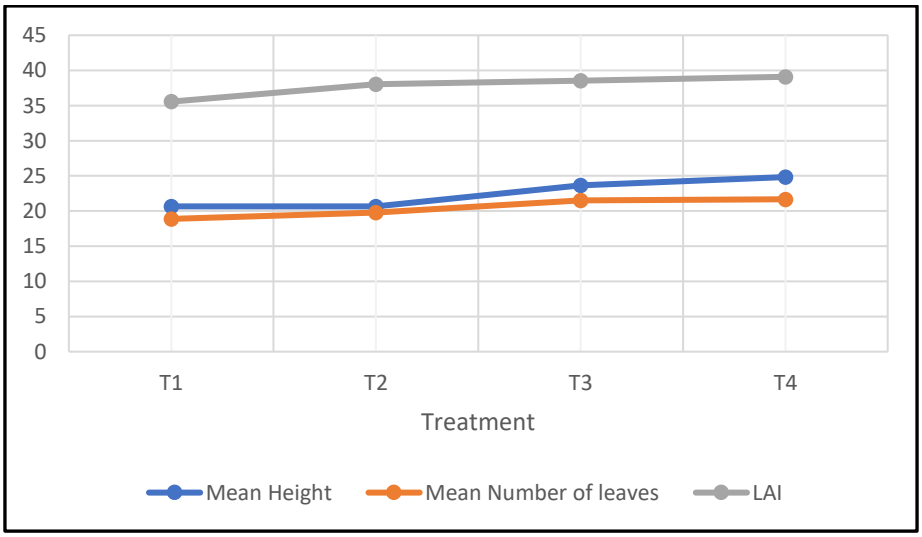

Fig. 1. Graph of mean heigh and number of leaves, and LAI

D. Cumulative Height, Number of leaves, and LAI

The cumulative height (Table 4) on the actual height of mulberry per hill per treatment; 15 days after transplanting (DAT) served as the initial height, the collection of data when the mulberry reached 30, 45, and 60 DAT. Treatment T4 obtained the highest cumulative height. It can be observed every 15 days interval up to 60 DAT T4 is far improved compared to the other treatments. As chicken dung application increases, cumulative height also increases (Figure 2). It shows that applying chicken dung at 100 grams or more during the vegetative stage could reach the maximum growth of mulberry up to 89.33 cm in 60 days. It indicated that chicken dung is a viable option as a good source of nitrogen. The chicken dung (organic fertilizer) has different benefits due to the adjusted supply of supplements, counting micronutrients, expanded soil

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supplement accessibility due to soil microbial movement, the decay of destructive components, soil structure changes and root advancement, and expanded soil water accessibility (Han et al., 2016).

Minimal differences can be observed on the entire treatments, although T4 obtained the highest cumulative leaf but minimal only, the same as other treatments. Table 5 showed that 15 days after transplanting (DAT), the T3 and T4 have an equal increment of leaf, the same with the T2 and T1. The presence of chicken dung affects only the height of mulberry, or mulberry requires a high amount of fertilizer. It emphasizes that T4 needs additional chicken dung to obtain the highest leaf increment. Based on figure 3, there was a cumulative increase in the number of leaves as chicken dung application increased. It implied an effect of nitrogen content in chicken dung which boosts the growth of mulberry.

The cumulative leaf area index (Table 6) showed the actual leaf size of mulberry per hill per treatment. Treatment (T4) obtained the widest cumulative LAI of 23.36 cm^2 after 60 DAT. On the other hand, T1 (control) produced narrow leaves a maximum of only 65 cm^2. The application of chicken dung widens the leaf area of mulberry because of its high concentration of macro-nutrient (Dikinya & Mufwanzala, 2010) aside from lengthening the stem and increasing the number of leaves.

TABLE 4. Cumulative Height (cm) of Mulberry at 15 days Interval

Treatment	15 DAT	30 DAT	45 DAT	60 DAT
1	44.33	50.83	57.5	65
2	54.67	62.67	70.83	78.33
3	63.17	72	80	88
4	66.67	75.5	82	89.33

TABLE 5. Cumulative Number of Leaf of Mulberry at 15 days Interval

Treatment	15 DAT	30 DAT	45 DAT	60 DAT
1	12	18.17	20.67	24.67
2	12.5	19.5	21.67	25.5
3	14	20.83	23.83	27.33
4	14	21.33	25.93	27.5

TABLE 6. Cumulative Leaf area index (cm^2) of Mulberry at 15 days interval

Treatment	15 DAT	30 DAT	45 DAT	60 DAT
1	18.91	19.92	20.4	21.16
2	20.6	21.47	21.81	22.18
3	21.01	22.11	22.41	22.84
4	21.86	22.61	22.98	23.36

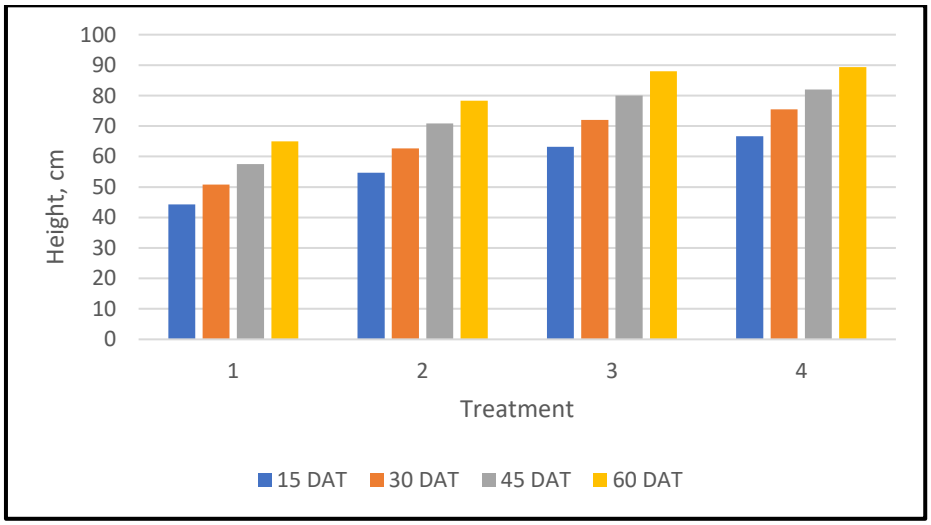

Fig. 2. Cumulative height of mulberry

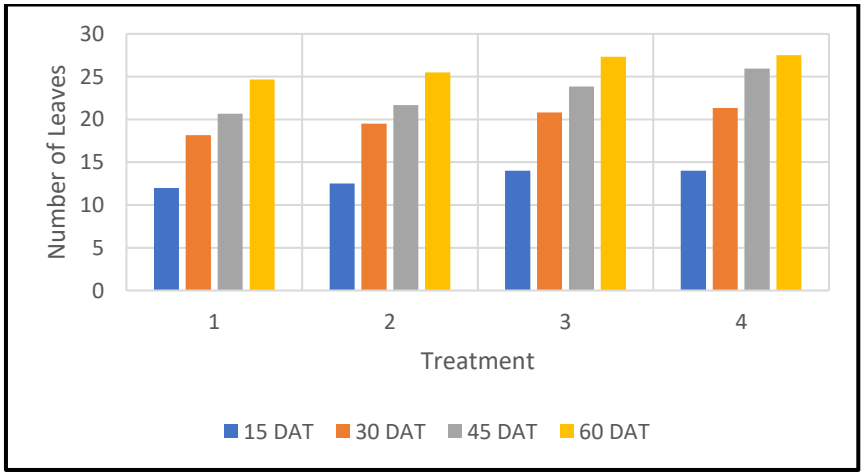

Fig. 3. Cumulative number of leaves of mulberry

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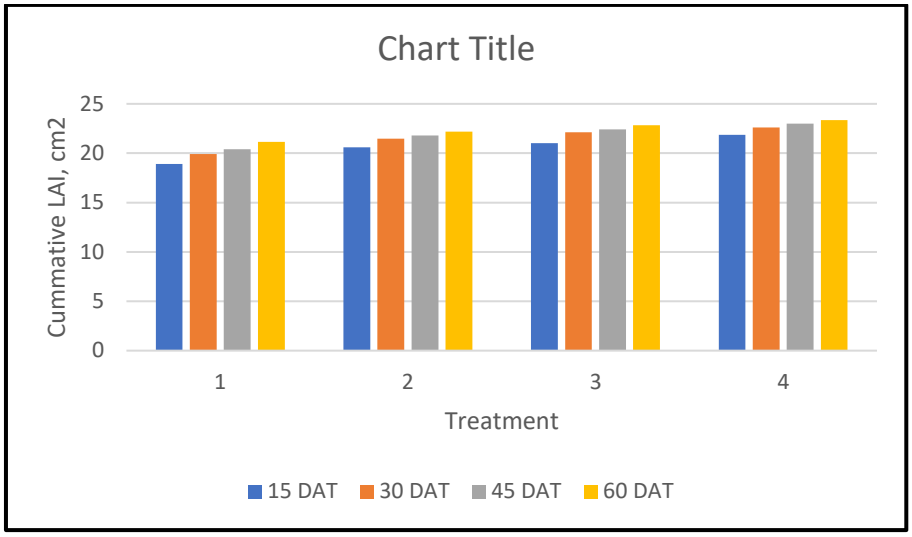

Fig. 4. Cumulative leaf area index (LAI) of mulberry

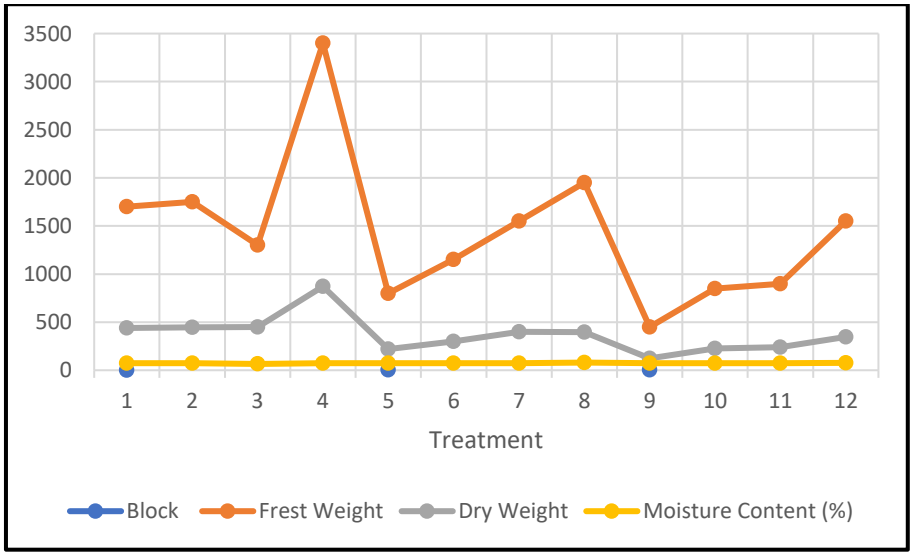

Fig. 5. Graph of fresh weigh, dry matter, and moisture contents of mulberry leaves

TABLE 7. Moisture Content (%) of Mulberry Leaves Per Treatment in all Blocks

Block	Treatment	Fresh Weight (kg/ha)	Dry Weight (kg/ha)	Moisture Content (%)
1	1	1300	451	65.31
	2	1700	441	74.06
	3	1750	446.5	74.49
	4	3400	871	74.38
2	1	800	219	72.63
	2	1150	298.5	74.04
	3	1550	396.5	74.29
	4	1950	398.5	79.67
3	1	450	123.5	72.56
	2	850	227.5	73.24
	3	900	239	73.44
	4	1550	347	77.61

E. Dry Matter Content

The moisture content (MC) (%) of mulberry leaves (Table 7) showed that higher MC content at those treatments with higher chicken dung application in all blocks. It is due to wider LAI and might be thicker leaves. Similarly, the amount of harvested fresh leaves are more in plots treated with a substantial amount of chicken dung, such as T4. Likewise, the resulting dry matters content is higher in T4 than in the rest of the treatments. The relationships are shown in figure 5; fresh weight, dry matter content, and moisture content are in ascending trend from T1 to T4 in every block due to increasing application of chicken dung.

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IV. Conclusion

The application of chicken dung to mulberry has a significant effect on its growth. The height, the number of leaves, and leaf area index (LAI) have increased as the application rate increases. Besides, chicken dung not only provides nitrogen and other micro-nutrients but also improves soil structure. Likewise, it is also vital to crops in problematic soil; as observed in all data, T4 was consistent, then T3, T2, and T1, respectively. Therefore, chicken dung application increases its effect on growth.

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