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The Response of Legumenous Fodder *Desmodium Cinereum* (Rensonii) on Varying Level of Chicken Dung Application

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***Abstract*—** *A study was conducted to investigate the number of leaves, height, and LA of Renzonii as affected by different levels of chicken dung application. The data was run in SAS version 9.0 appropriate for RCBD single factor. The study resulted in great significance at alpha 5% for the number of leaves, height, and LA. T4 obtained significant results in all parameters with the mean value of 17.96, 23.83, and 21.08, respectively. This was attributed to the response of Rensonii to phosphorus fertilizer since chicken manure contains as much nitrogen as farmyard manure but is richer in potassium and phosphorus and used as a soil amendment in composted bark production. The study also investigated the fresh and dry weight, and the moisture content of the Rensonii leaves, it appears that T4 obtained a significant effect which T4 gained the highest fresh and dry weight, this was attributed to a higher number of leaves and wider leaf area index (LA). The rensonii are usually planted for animal feed thus the result of the study could benefit the farmers, especially the animal raiser who has a Rensonii plantation. At 100 grams rate of chicken dung application as organic fertilizer for rensonii significantly improved the number of leaves and LA of renzonii.*

***Keywords*—** *Direct energy input, indirect energy input, embedded energy input, liter diesel oil equivalent, eggplant, tomato*.

I. INTRODUCTION

Bush groundnut Desmodium cinereum (Kunth) DC. Family: Fabaceae (alt. Leguminosae). The ordinarily cultivated origin was misidentified as Desmodium rensonii. A short life span of about 2-3 years, erect shrub 1-3 m in height. Erected stems have minimal branches and are like to become woody. Its branches are densely covered with short white hooked hairs (Gutteridge et al., 1994). Leaves trifoliate round with terminal leaflet slightly pointed. The leaflets are usually thick, 5-7 cm long, covered in soft hairs lying flat against the lamina; present on both surfaces, but especially underneath. Stipules are about 3 mm long, shedding early. Originated from wet tropics in areas with an average annual rainfall from about 1400 to 4000 mm/yr, with a limited dry season, and has been sown in the wet tropics where the average annual rainfall exceeds about 1500mm (Horne, P.M. et al., 1999).

Renzonii is used as nitrogen-rich mulch in alley-cropping systems and it responds to phosphorus fertilizer on low P soils it requires moderately fertile soil, and acidic to neutral soils. Due to iron deficiency, it becomes chlorotic in alkaline soil, with annual rainfall from about 500 to 4,000 mm/yr and sown in the wet tropics where average annual rainfall exceeds about 1,500 mm (Roshetko, J.M. 1995). Growth rates in humid-tropical regions were higher when rensonii was cut every 2 months, rather than a longer time interval, and averaged 1.1–1.9 kg/m row/year DM. Yields declined to 0.5 kg/m row/year DM by the end of the third year of production, (Roshetko, J.M. 1995). Therefore, the current research study aims to characterize the growth in terms of height, the number of leaves, and the leaf area of renzonii in response to a different rate of chicken dung application.

II. MATERIALS AND METHODS

2.1 The Study Sites

The study was conducted in Basilan State College, College of Agriculture and Fisheries, Sta. Clara Campus, Lamitan City, Philippines (Figure 1). It has a coordinate latitude of $6^0$40’52.24” N and a longitude of 122°03’40” E. The area has Bulawan clay loam type of soil with a mean annual temperature (MAT) and precipitation of 26°C and 1100 mm, respectively (Bangsamoro Development Agency., 2016; Jalil et al., 2021). The area has a type III climate classification, where the season is not very pronounced, somewhat dry from November to April, and wet the rest of the year (Bangsamoro Development Agency, 2016).

2.2 Experimental Design

The experimental area was appropriate for Randomized Complete Block Design (RCBD) with four treatments and replicated three times. It has utilized seventy (70) square meters wide of land divided into three blocks; each block was divided into four plots, a total of twelve plots (12) for the entire experimental unit. The plots have one meter (1 m) width by one (1) meter length in size. Plowing and harrowing of the field several times (lengthwise and crosswise) were done to loosen and soften the soil and make it easy to remove weeds. The area should be free from weeds due to competition for nutrients. The seedlings were collected from well-matured 6-8 months old shoot cuttings of about 1.5 cm diameters and 15-20 cm in length with 3-4 healthy buds selected from the Renzonii plantation. The transplantation of seedlings was when the seedlings reached six (6) months old at the spacing of 1x1 meter to the experimental area to a depth of 30-40 cm. The soil should be well pulverized. Each plot contained two seedlings used as representatives for gathering data. Fifteen days after transplanting, treatment one (T1) served as a control

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(no fertilizer), 15 grams of chicken dung to T2, 50 grams of chicken dung to T3, and 100 grams of chicken dung to T4. The treatments were evaluated by the following indicators; the number of leaves, height, leaf area (LA), the cumulative number of leaves, plant height, fresh weight, dry weight, and Moisture Content (%) of Renzonii Leaves.

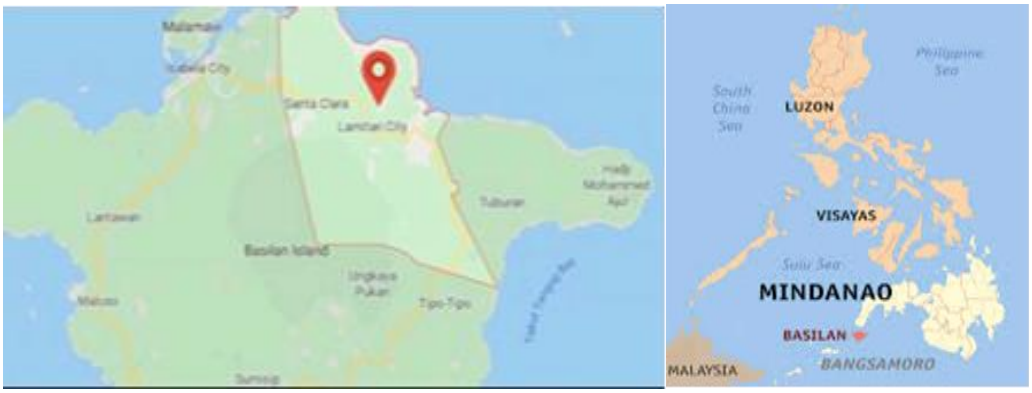

Fig. 1. Map of Lamitan City, Basilan, Philippines

2.3 Collection of Data

The data gathering started 15 days after transplanting for initial data, and the further collection was done every fifteen days at intervals up to 60 days. The number of leaves was collected and determined by counting the total number of leaves of each plant and then summing up all the leaves and dividing them by the total number of plants in each plot per treatment. Plant height was also collected and determined by measuring all individual plants from the ground up to the apical tip of the plant using a meter stick in each plot per treatment.

The LA of renzonii was collected and calculated using the following equation; LA = SLA x leaf mass (Baret et al., 2010; Ali et al., 2017). Where the SLA is the Specific Leaf Area obtained using a Li-3000 leaf area meter (SLA, the leaf area per unit of dry leaf mass). Leaf mass is the total dry mass of a plant leaf (Baret et al., 2010).

The cumulative height, number of leaves, and LA were measured every 15, 30, 45, and 60 days after transplanting (DAT) and investigated for the average increment. When the rensonii plants reached sixty days (60) after transplanting (DAT), all the plant leaves were harvested, and the fresh weight was measured by weighing all the plant leaves per treatment and drying for three (3) days continuously of sun drying. The percent moisture and dry matter content were determined using the formula %MCwb = (FW-DW)/FW*100, where FW and DW are fresh and dry weight, respectively.

2.4 Statistical Data Analysis

The randomized complete block design (RCBD) was used to determine the significant effect of chicken dung on the number of leaves, height, LA, and dry matter content of rensonii. The data were subjected to analysis of variance procedure using SAS version 9.0, and Fisher's LSD test was used for mean comparison.

III. RESULTS

A. Number of Leaves of Rensonii

Table 1 below shows T4 obtained the highest number of leaves with a mean of 17.96 per hill per plot compared to the other treatments, followed by T3 at 16.59, T2 at 14.29, then T1 at 12.75, respectively. The analysis of variance revealed blocking efficiency was effective, and the treatment was significant since the F value of 5.12 is greater than the P-value of 0.0430 @ $\alpha = 0.05$, which indicates that it has at least one treatment mean that has a significant difference among means.

The LSD test was computed and used to compare the means. It reveals at LSD of 3.8002, the T4 at 100 grams of chicken dung application has significantly affected the number of leaves of rensonii compared to T2 and T1. Although, T4 appears no different from T3. Table 1 shows that T4 is far more effective than other treatments. As the rate of chicken dung application increases, the number of leaves also increases, which implies chicken dung application at 100 grams has a significant effect on rensonii under Bulawan clay loam type of soil.

TABLE 1. Average Number of Leaves of Rensonii

Treatment	Replication			Total	Mean
	I	II	III		
T1	8.13	13.5	16.63	38.26	12.75c
T2	13	13.38	16.5	42.88	14.29bc
T3	11.13	16.38	22.25	49.76	16.59ab
T4	13.5	19.13	21.25	53.88	17.96a
Block Total	45.76	62.39	76.63		
Grand Total				184.78	
Grand Mean					15.398
Significance= *					

Ns = None Significant, * = Significant, ** = Highly Significant.
Means with the same letters are none significantly different.
CV = 11.54308
LSD = 3.5511

B. Height of Rensonii

Table 2 shows the average height of rensonii as affected by different levels of chicken dung. The treatment (T4) obtained the highest mean value of 23.83 compared to the other treatment means, followed by T3, T2, and T1 with the values of 22, 21.83, and 21.16, respectively. The analysis of variance revealed an effective blocking and significance in terms of height as the F value of 1.08 is greater than the P-value of 0.4257 @ $\alpha = 0.05$ which means there is at least one treatment

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mean that has a significant difference from the other treatment means.

The mean comparison was done to determine the differences between the means. The computed LSD of 3.8002 resulted in non-significant. Based on table 2, shows that the chicken dung indeed affects the height of rensonii to a minimum only. It is mainly due to the characteristic of rensonii as a bush. Hence, it is also observable that as the rate of chicken dung application increases, the mean height of rensonii also increases.

TABLE 2. Average Height of Rensonii

Treatment	Replication			Total	Mean
	I	II	III		
T1	20	21	22.5	63.5	21.16a
T2	21.5	22	22	65.5	21.83a
T3	17	23.5	25.5	66	22a
T4	22.5	23	26	71.5	23.83a
Block Total	81	89.5	96		
Grand Total				266.5	
Grand Mean					22.208
Significance = ns					

Ns = None Significant, * = Significant, ** = Highly Significant.
Means with the same letters are none significantly difference.
CV = 8.564887
LSD = 3.8002

C. Leaf Area (LA)

Table 3 reveals the highest mean LA obtained by T4 with the mean of 21.08, followed by T3 at 18.54, T2 at 17.58, then T1 at 16.89, analysis of variance revealed effective blocking and significant results in LA since the F value of 8.24 is greater than the P-value of 0.0151 @ α = 0.05 which mean there is at least one treatment mean that has a significant difference among means.

The LSD was determined to obtain the significant differences among means; LSD value of 2.2142 resulted in T4 at 100 grams rate of chicken dung application was significantly different compared to T3, T2, and T1. Its implication, the 100 grams rate of chicken dung application has enhanced the LA of Renzonii. Thus, with similar results with the number of leaves and average height as the rate of chicken dung increases, the LA also increases.

TABLE 3. Leaf Area Index (LAI) of Rensonii

Treatment	Replication			Total	Mean
	I	II	III		
T1	14.76	15.57	20.33	50.66	16.89b
T2	15.85	16.3	20.58	52.73	17.58b
T3	14.83	18.031	22.75	55.61	18.54b
T4	17.14	21.835	24.27	63.25	21.08a
Block Total	62.58	71.74	87.93		
Grand Total				222.246	
Grand Mean					18.5205
Significance= **					

Ns = None Significant, * = Significant, ** = Highly Significant.
Means with the same letters are none significantly different.
CV = 5.98
LSD = 2.2142

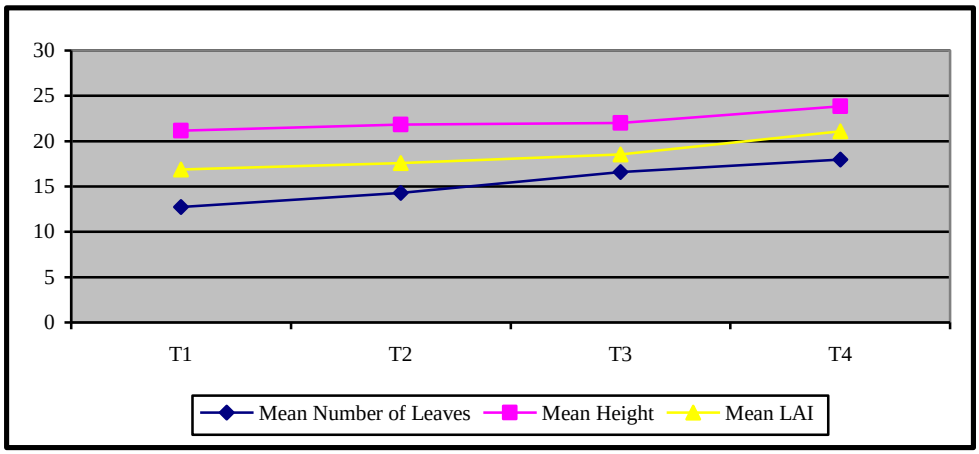

Fig. 2. Graph of mean number leaves, mean height and mean LA

D. cumulative Number of Leaves and Height of Rensonii

Table 4, shows the cumulative number of leaves of rensonii per hill per treatment. Initial data were collected at 15 DAT and continued when the rensonii reached 30, 45, and 60 DAT. T4 obtained the highest cumulative number of leaves compared to other treatments. At 15 days intervals, treatment (T4) enhanced by the chicken dung application, which means obtaining the maximum number of leaves in 100 grams level of chicken dung is ideal. Eltilib et al. (1993) showed that chicken manure was very effective in counteracting the salinity effect, which was reflected in the proportionate promotion of growth and yield in response to the applied amount. Leaf was reduced by salinity and increased by the addition of chicken manure.

TABLE 4. Cumulative Number of Leaves of Rensonii

Treatment	15 DAT	30 DAT	45 DAT	60 DAT
T1	8	11.33	13.5	18.17
T2	8.67	13.33	15.5	19.67
T3	11.17	15.33	17.67	22.17
T4	12.67	17.33	18	23.83

The cumulative height of rensonii indicated in table 5 below shows the highest cumulative height obtained by treatment (T4). Treatment 4 was far improved compared to T3, T2, and T1. Similar results with table 4 as the rate of

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chicken dung increases, the cumulative value also increases. To obtain the maximum height of Rensonii, ideally, 100 grams level of chicken dung application is recommended. It was mainly due to chicken manure being a potential source of plant nutrients and chemical conditioner.

For instance, the EC bind with exchangeable bases increased with application rate in all soil types, thus indicating positive effects on soils. Similarly, a significant increase in N (up to 50%) and P (up to 80%) was found by incorporating chicken manure by Dikinya et al., 2010.

TABLE 5. Cumulative Height (cm) of Rensonii

Treatment	15 DAT	30 DAT	45 DAT	60 DAT
1	32.83	39.5	46.67	54.0
2	33.67	42.0	48.67	55.5
3	40.17	48.17	55.0	64.0
4	46.67	54.5	61.67	68.67

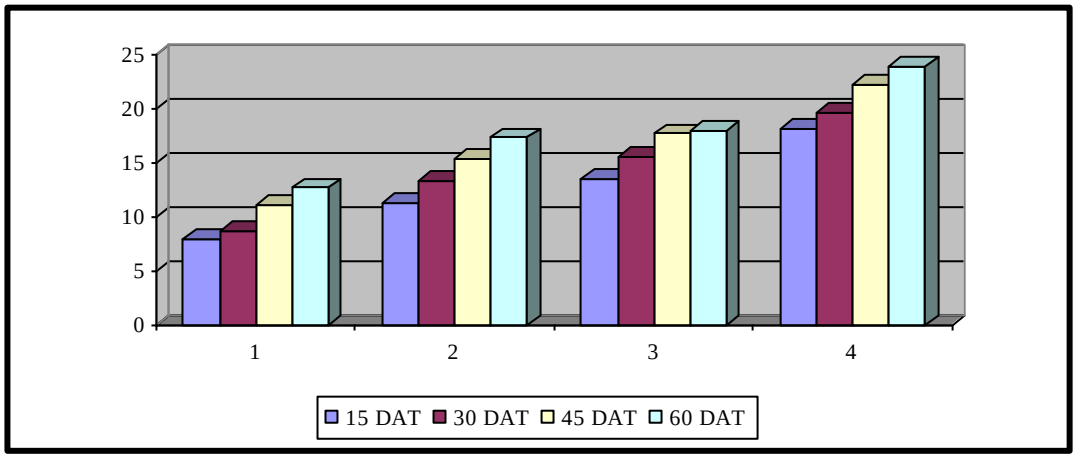

Fig. 3. Cumulative Number of Leaves of Rensonii

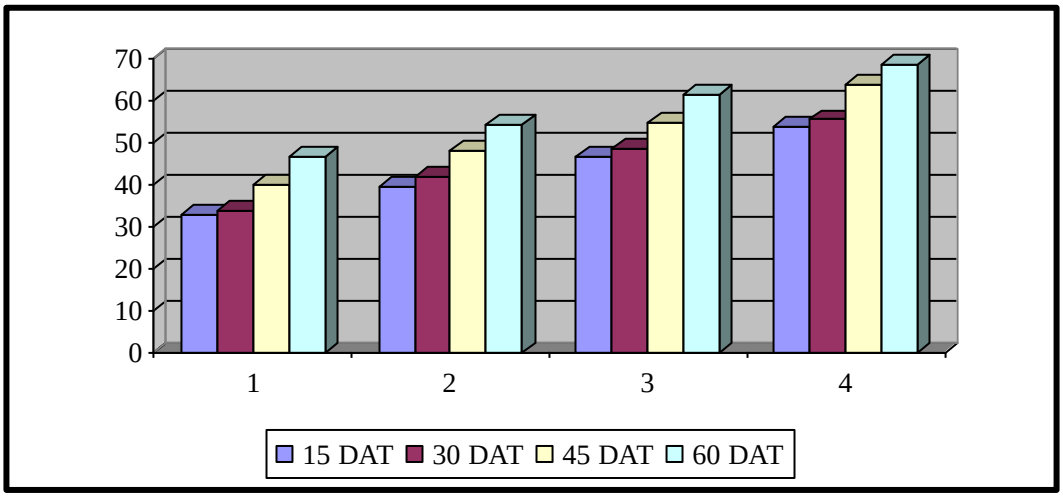

Fig. 4. Cumulative height of Rensonii

TABLE 6. Fresh weight, Dry weight, and Moisture Content (%) of Rensonii Leaves Per Treatment in all Blocks

Block	Treatment	Fresh Weight (Kg/ha)	Dry Weight (Kg/ha)	Moisture Content (%)
1	T1	1000	260	74
	T2	500	126.5	74.7
	T3	500	127	74.6
	T4	3500	883	74.77
2	T1	500	131	73.8
	T2	700	188	73.14
	T3	750	199.5	73.4
	T4	1300	341	73.77
3	T1	650	171.5	73.62
	T2	700	189	73
	T3	900	242	73.11
	T4	1100	301	72.64

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E. Fresh weight, Dry weight, and Moisture Content (%)

The fresh weight, dry weight, and moisture content (%) of Renzonii leave shown in table 6, the highest fresh and dry weight obtained by T4 in all blocks. It indicated that 100 grams of chicken dung improved the mass of renzonii due to the highest number of leaves. For this reason, the highest moisture content was obtained by the treatment (T4) followed by treatment (T2), (T3), and (T1) in block 1. For block 2, obtained by treatment (T1) followed by treatment (T4), (T3), then (T2). In addition, for block 3, the highest moisture content was obtained by treatment (T1) followed by (T3), (T2), then (T4), respectively. The result was due to the higher dry matter content of T4 which is ideal for animal raisers who rely on renzonii to feed their animals.

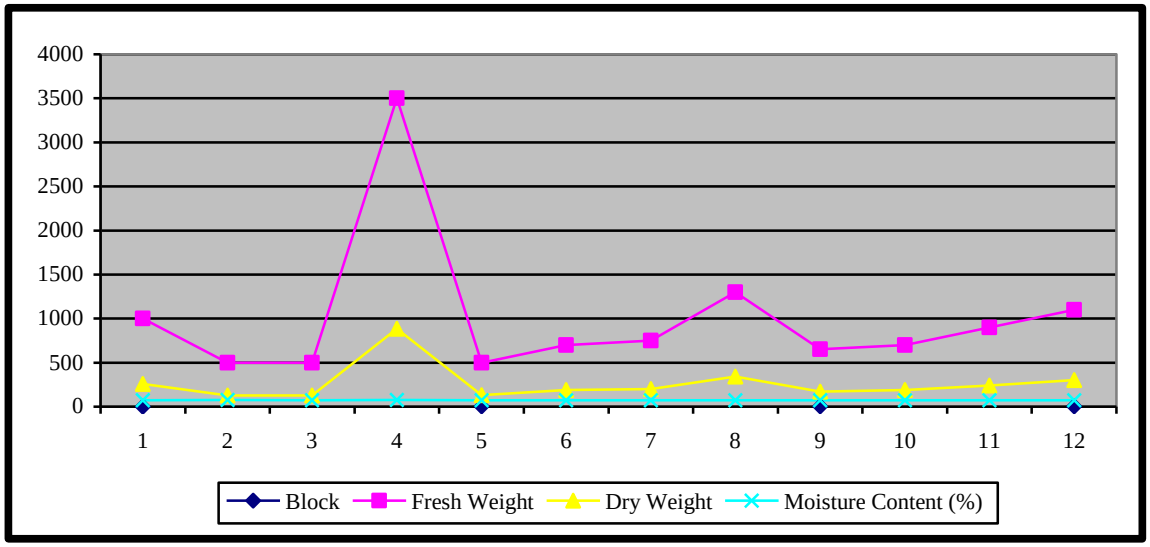

Fig. 5. Graph of fresh weight, dry matter, and moisture content of Rensonii

IV. Conclusion

As have observed in the tables, 100 grams rate of chicken dung application consistently affected the rensonii this was mainly due to the high EC in chicken manure is attributable to higher salt levels of N and P nutrients which are proportionally high, and according to Elzilal (2002), the chicken manure applied at a comparatively high rate substantially increased the yield of dry matter plant. The same observation with Farori et al. (1995) that the application of chicken manure significantly increased nodulation and dry matter production.

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