EFFECT OF PINCHING AND POULTRY MANURE APPLICATION RATES ON GROWTH AND DRY MATTER YIELD OF JUTE (*Corchorusolitorius*) IN KABBA, NIGERIA

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ABSTRACT

The effect of pinching and poultry manure application rates on growth and dry matter yield of *C. olitorius* was evaluated at the Horticulture section, College of Agriculture, Kabba, Nigeria. The experiment was a 4×5 split plot in CRD with five replicates. The main plot consisted of 5 poultry manure (PM) rates (0 t/ha, 4 t/ha, 8 t/ha, 12 t/ha and 16 t/ha) while the subplot treatments included the four pinching levels (P_0-no pinching, P_2-pinching @ 2^{nd} node, P_4-pinching @ 4^{th} node and P_6-pinching @ 6^{th} node). Growth, dry matter and dry matter distribution were studied. Analysis of variance was used to analyze variation among treatments. Analysis of variance result showed that most of the growth and dry matter yield varied statistically ($P \leq 0.05$). Plants grown under P_0 had the tallest plants (30.13 cm) and (58.27 cm) at 4 and 6 weeks after planting (WAP), it also produced the widest stem across the weeks. Pinching at P_4 gave the heaviest root weight (7.52 g). However, P_6had the heaviest dry shoot weight (17.97 g), total dry weight (20.97 g) and shoot/root ratio (6.18 g). Plants treated with 16 t/ha of PM gave the highest plant height, number of branches, broadest stem, heaviest fresh root weight, dry root weight and total dry weight. Plants that received 4 t/ha had the highest shoot/root ratio of 7.72. Dry matter distribution to the root was highest in plants grown with 12 t/ha of PM (20.93 g). In most cases, interaction of the factors was not significant ($P \leq 0.05$). Conclusively, pinching at P_6 and soil amendment at 16 t/ha that enhanced some of the growth and dry matter yield is recommended for containerized *C. olitorius* production in homes.

Key words:*Corchorusolitorius*, pinching, poultry manure, dry matter yield

INTRODUCTION

Jute (*Corchorus olitorius*), an underutilized indigenous vegetable food crop in Nigeria belongs to the family Tiliaceae. It is an annual herb and it can reach a height of 2 to 4 m (Hassan, and Kadhim, 2018). The plant has a simple, lanceolate, finely serrated leaf distributed alternately (Hassan and Kadhim, 2018). It has small yellow flowers of 2 to 3 cm in diameter with 5 petals. The fruit produced by this plant has numerous seeds enclosed in it. *Corchorus olitorious* is commonly known as wild okra, Jew's mallow and jute mallow (Loumerem and Alercia 2016). In Nigeria, jute is called 'Ahihara' in Igbo, 'Ewedu' in Yoruba and 'Malafiya' in Hausa (Ogunkanmi *et al.*, 2010).It is cultivated in the tropics for the viscosity of its leaves. Leafy vegetables play crucial roles in alleviating hunger and food security. The leaves and fruits are made into soup comparable to Okra; it is used for eating starchy balls made from millet, cassava and yam.

Corchorus olitorius is a good source of vitamin A and C, fibre, and other micronutrients (Ndlovu and Afolayan, 2008). It is widely utilized as a healthy vegetable in Japan due to the abundance of carotenoids, vitamin B, B_2 and E (Oloye *et al.*, 2014). The leaves contain calcium, iron, zinc, and antioxidant properties (Okunlola *et al.*, 2017). The young shoot tips can be eaten raw or cooked and it contains high levels of protein (Shittu and Ogunmoyela, 2001). The leaves and roots are used as herbal medicine for treating gonorrhea as well as toothache (Hillocks, 1998; Asia Vegetable Research Development Center (AVRDC), 2004). Fibres from the bark are used for weaving bags, net and textile production (Sinha*et al.*, 2011). It can also be utilized to produce absorptive fibre for surgical dressings (Al-Snafi, 2016).

Pinching is a horticultural practice that diverts the flow of energy and nutrients from a single stem system to a multi stem system. More the number of side branches, more the plant gains a bushy appearance as a result, time and money lost in intercultural operations will be reduced thus supporting greater benefit from less investment (B.C. *et al.*, 2020). The yield of crops can be manipulated by inhibiting the vertical growth and encouraging side shoots of plants with the help of pinching (Baskaran and Abirami, 2017).

The increasing demand for *C. olitorius* due to urbanization has pushed farmers into small and medium scale production of *C. olitorius* in Nigeria. Cultivation of *C. olitorius* is in serious decline due to low soil fertility, pest and diseases and agronomic practices such as pinching. Soil fertility could be enhanced using organic or inorganic fertilizers and could be integrated (Aba *et al.*, 2020). Excessive and indiscriminate use of chemical fertilizers leads to soil degradation and imposes a serious threat to human health (Fujimoto, 1998). Obtaining optimum yield, organic fertilizers are being developed by farmers from farm and city wastes for vegetable production. In an attempt to properly use city wastes, Onyibe et al. (2021) discovered that yam peels which they burnt or used in fresh states and incorporated into soils resulted in high availability of nutrient elements, enhanced organic matter content and structure of soil, and brought about improved crop yield. Organic manure increases the nutrient status of the soil as well as crop yield (Ibeawuchi *et al.*, 2006). They added that environmental hazards due to waste pollution get reduced. Obiazi *et al.* (2020) observed significant seedling growth improvement in sandy soil which was enhanced with swine manure. Leafy vegetables have been found to perform well in peat soils, very rich in organic matter (Siemonsma, 1991). They require a lot of nitrogen for protein synthesis in the leaves (Akanbi and Togun, 2002). Hence, investigating into the effect of pinching and poultry manure application rates on growth and dry matter yield of *C. olitorius*is necessary. This provides useful information that could encourage the growing of the crop in homes thereby producing additional income, ensuring food security, and improving the diet of the people. This study was carried out to investigate the effect of pinching and poultry manure application rates on growth and dry matter yield of *C. olitorius*.

MATERIALS AND METHODS

Experiment Site: The experiment was conducted at Horticulture section, College of Agriculture, Kabba (7.8231˚N, 6.0732˚E and 400 m above sea level), in Southern Guinea Savanna Zone of Nigeria. The Mondial rainfall spans April to November with peak in June and dry season extends from December to March. The mean annual rainfall is 1570 mm per annum with an annual temperature range of 18-32˚C. The mean relative humidity is 60%.

Collection of Soil Samples: The potted soil was collected and analyzed to determine the physical and chemical composition. Poultry manure used was also analyzed.

Plant materials: The seeds of *C. Olitorius* was sourced from a local farmer within Kabba.

Nursery preparation: The seedlings were planted in hundred polyethylene bags of size 48 x 38.5cm filled with a mixture of topsoil (12 kg) and poultry manure. Each rate of the poultry manure was mixed in the soil and left for 2 weeks before planting as to ensure proper decomposition. The seeds were planted in January 2022 and after emergence, the seedlings were thinned to 5 plants/pot. Pinching was done at three weeks after planting. At the tender stage, the seedlings were shaded to protect them from harsh weather condition.

Poultry manure rate was calculated as follows:

$$\frac{\text{PM rate (kg) x weight of potting medium (kg)}}{\text{2,242,000 (furrow slice per ha)}}$$

Weeding: Weeding was done manually using hoe to prevent competition for nutrients and space.

Experimental Design: The experiment was arranged as 4×5 split plot in CRD with five replicates. The main plot included 5 poultry manure rates (0 t/ha, 4 t/ha, 8 t/ha, 12 t/ha and 16 t/ha) while the subplot treatment involved the four pinching levels (P_0-no pinching, P_2-pinching @ 2^{nd} node, P_4- pinching @ 4^{th} node and P_6- pinching @ 6^{th} node).

Data Collection: The following data were collected:

Plant height: Plant height (cm) was measured from the root base to the apex of the plant using flexible meter rule and the average recorded.

Number of leaves: Total number of fully opened leaves were counted, and the average taken.

Numbers of branches: Number of branches were counted and the average recorded.

Stem girth: The vine girth was measured with a Vernier caliper at 5 cm above the ground level.

Fresh weight of shoot: The fresh weight of the above ground part was collected and weighed using sensitive weighing balance and the average recorded.

Fresh weight of root: The fresh weight of the below ground part was taken using sensitive weighing balance and the average recorded.

Total fresh weight of shoot and root: Total fresh weight of the shoot and root were collected, weighed using sensitive weighing balance and the average recorded.

Dry weight of shoot: Dry weight of shoot was taken using sensitive weighing balance and the average recorded.

Dry weight of root: Dry weight of root was collected using sensitive weighing balance and the average recorded.

Total dry weight: The total dry weight of shoot and root were taken using sensitive weighing balance and the average recorded.

Shoot/Root ratio: It was calculated as$\frac{Dry\ shoot\ weight}{Dry\ root\ weight}$

Dry matter distribution to the shoot (DMDS) and root: Dry matter distribution to the shoot was calculated as *% Dmds*= $\frac{Dry\ matter\ to\ the\ shoot}{Total\ dry\ matter} X\ 100$

Dry matter distribution to the root= = $\frac{Dry\ matter\ to\ the\ root}{Total\ dry\ matter} X\ 100$

3.8 Statistical analysis

All the data collected were subjected to the analysis of variance (ANOVA) following the procedures outlined for CRD using GENSTAT Discovery edition 3 Release 7.22 DE (GENSTAT, 2008). Significant treatment means was compared using least significant difference (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

Physicochemical properties of soil and poultry manure utilized in the study

Table 1 showed the properties of the potted soil and poultry manure used in the study. The results indicated that the soil is characterized to be sandy clay loam with low pH in water (5.80). The soil organic matter, organic carbon, nitrogen and phosphorus were low at 2.63%, 1.53%, 0.09% and 7.06 ppm, respectively. The K^+, Ca^{2+} and Mg^{2+} were 0.10, 1.00 and 1.20 cmol kg^{-1}, respectively. The poultry manure used shows high contents of organic matter (86.10%), nitrogen (1.35%), phosphorus (0.54%) and potassium (0.19%). The poultry manure has the potential to enhance plant growth. Ani and Baiyeri (2008) reported that poultry manure is the richest of the animal manures and is a valuable source of nutrients, organic matter, particularly nitrogen and potassium. Chukwuka and Omotayo (2009) reported that application of organic fertilizers significantly ($P \leq 0.05$) improves the soil chemical properties and nutrient uptake in plants which in turn enhanced plant growth.

Table 1: Physicochemical properties of the pottedsoil and the poultry manure utilized in the study

Mechanical properties	Soil Particle size	Poultry manure
Clay (%)	27.00	-
Silt (%)	9.00	-
Fine sand (%)	29.00	-
Coarse sand (%)	35 .00	-
Textural class	Sandy clay loam	
Chemical properties		
pH in water	5.80	8.4 (%)
pH in KCl	4.20	8.2 (%)
Organic carbon (%)	1.53	57.96 (%)
Organic matter (%)	2.63	86.10 (%)
Total nitrogen (%)	0.09	1.35 (%)
Phosphorus (ppm)	7.06	0.54 (%)
Exchangeable base		
Sodium (Na^+) cmol/kg	0.07	0.01 (%)
Calcium (Ca^{2+}) cmol/kg	1.00	6.70 (%)
Potassium (K^+) cmol/kg	0.10	0.19 (%)
Magnesium (mg^{2+}) cmol/kg	1.20	5.24 (%)
CEC	15.60	-
Base saturation (%)	52.00	-
Exchangeable acidity in me/ 100 g soil		
Aluminium (Al^{3+})	0.40	-
Hydrogen (H^+)	5.80	-

Source: Laboratory of the Department of Soil Science, Faculty of Agriculture, University of Nigeria, Nsukka.

Growth parameters

Table 2 presents the main effect of pinching and poultry manure application rates on plant height of *C. olitoriu* at 4, 6, 8, 10 and 12 weeks after planting (WAP). Pinching showed significant ($p < 0.05$) difference on plant height only at 2 and 6 WAP but did not differ at 8, 10 and 12 WAP. Plants grown under P_0 had the tallest plants (30.13 cm and 58.27 cm) at 4 and 6 WAP, respectively. However, P_2 gave the shortest plants at 4 and 6 WAP with respective values of 16.00 and 37.30 cm. It was established that increase in pinching level resulted to decrease in plant height of *C. olitorius*. Reduction of the vine length can be better explained in the lights of Anand *et al.* (2014) who mentioned that pinching of vines decreases the vine length due to reduced accumulation of photo assimilates at the tips. Collapse of apical dominancy can lead to reduction in plant height (Sahu and Biswal, 2020). The result obtained in this study is in line with those of Kattel *et al.* (2023) who reported decrease in plant height of Okro as the pinching level increases. Nayak *et al.* (2018) reported minimum length of vine in Cucumber when pinching was done at 6th node.

Poultry manure (PM) application rates significantly ($p <0.05$) influenced plant height of *C. olitorius* at 4 and 6 WAP but was statistically similar at 8, 10 and 12 WAP. Plants treated with 16 t/ha of PM gave the highest plant height (28.58and 55.12cm) at 4 and 6 WAP, respectively. The least plant height (17.04 and 38.21 cm) was obtained in the control where PM was not applied. The reduced height of plants not subjected to PM can be attributed to deficiency of nitrogen in the soil and hence stunted plants. Organic materials enhance soil properties and improve the soil nutrient content (Dauda *et al*., 2005; Ndukwe *et al.*, 2009). Asiegbu and Okpara (2000) observed that higher poultry manure rates supported the growth of plants than the control where manure was not applied.

Table 2: Main effect of pinching and poultry manure application rates on plant height (cm) of *C. olitorius*in weeks after planting

	Plant height in weeks after planting				
Pinching	4	6	8	10	12
P_0	30.13	58.27	73.00	116.8	134.10
P_2	16.00	37.30	58.90	91.70	115.30
P_4	18.27	41.83	61.70	100.4	118.90
P_6	21.90	46.27	68.00	101.00	119.70
LSD (0.05)	3.392	5.219	NS	NS	NS
Poultry manure rates (t/ha)					
0	17.04	38.21	59.3	98.4	115.4
4	18.75	42.83	62.2	101.9	121.3
8	21.92	46.75	66.6	104.3	123.1
12	21.58	46.67	65.2	103.4	122.8
16	28.58	55.12	73.7	104.5	127.5
LSD (0.05)	3.793	5.835	NS	NS	NS

P_0=no pinching, P_2=pinching @2nd node, P_4=pinching @4th node and P_6=pinching @6th node. Non-significant.

The interaction of the factors showed no significant (p> 0.05) effect on most of the traits evaluated in this study (Tables not shown for want of space).

The main effect of pinching and poultry manure application rates on number of leaves of *C. olitorius* at 4, 6, 8, 10 and 12 weeks after planting (WAP) is presented in Table 3. Pinching had no positive impact on number of leaves across the weeks. However, P_6 (pinching at 6th node) had the tendency to produce maximum number of leaves at 12 WAP than others. Earlier study of Kattel *et al.* (2023) reported variation in the leaves of Okro as affected by pinching which is contrary to this finding.

Poultry manure application rates had no significant (p>0.05) influence on number of leaves at 4, 6, 8, 10 and 12 WAP. Application of 16 t/ha had the tendency to produce more leaves. The non-significant difference in number of leaves at application of 0 to 16 t/ha of PM across the weeks may be adduced to the genetic makeup of *C. olitorius L.* This confirms the views of Adeniji and Kehinde (2007) who reported a similar effect on *Abelmoschus caillei* (A. chev) Stevels. Similar results were observed with Ogunrinde and Fasinmirin (2011); Koura *et al.* (2013) in *C. olitorius.*

Table 3: Main effect of pinching and poultry manure application rates on numbers of leaves of *C.olitorius* in weeks after planting.

	Number of leaves in weeks after planting				
Pinching	4	6	8	10	12
P_0	30.3	76.6	99.1	125.9	172.6
P_2	36.7	85	107.6	133.5	181.2
P_4	45.7	96.8	119.1	149.5	199.4
P_6	49.3	96.8	122.4	153.4	207
LSD (0.05)	NS	NS	NS	NS	NS
Poultry manure rates (t/ha)					
0	30	84.8	103.5	128.7	174.5
4	41.5	92.2	118.7	147.5	192.1

8	46.5	93.7	117.1	145.1	189.6
12	35.7	75.3	98.4	126.1	182.1
16	48.7	98.1	122.7	155.4	212
LSD (0.05)	NS	NS	NS	NS	NS

P_0=no pinching, P_2=pinching @2nd node, P_4=pinching @4th node and P_6=pinching @6th node. Non-significant.

The main effect of pinching and poultry manure application rates on numbers of branches of *C. olitorius*at 4, 6, 8, 10 and 12 weeks after planting (WAP) is shown in Table 4. Plants grown under P_6 produced more branches at 4, 6, 8 and 10 WAP with 3.47, 8.07, 21.7 and 38.17, respectively. Although the value obtained in P_6 was at per with P_2 (36.00) and P_4 (37.90) at 10 WAP. Plants grown with P_0 gave the least number of branches at 4, 6, 8 and 10 WAP with 1.90, 6.10, 15.60 and 31.67, respectively. Increase in number of branches due to pinching can be attributed to diversion of concentrations of auxins from the tips of the lower part and thereby the plant becomes more active physiologically and thus increasing the number of branches. Anand *et al.* (2014) reported similar result in Bottle gourd. This result also confirmed the finding of Choi and Jafhan (1999) in cucumber. Lowes (2009) observed that pinching encourages the development of more lateral shoots or branches. Pinching produces more vegetative growth in the form of side branches (Nagdeve*et al.*, 2021).

Poultry manure application rates significantly ($p < 0.05$) influenced number of branches of *C. olitorius* only at 4, 6 and 8 WAP but all other weeks were statistically similar. Highest number of branches (3.38, 8.88 and 22.83) at 4, 6 and 8 WAP was associated with the plants that received 16 t/ha. The least numbers of branches at 4, 6 and 8 WAP was obtained in the control with respective values of 1.90, 6.10 and 15.60. Increasing poultry manure rate led to improvement in number of branches of *C. olitoriu*. This has been the consequence of higher nutrient availability and increased nitrogen from organic manures. O'Brien and Barker (1996) on pepper mint, observed that increasing organic manures levels in soil improved significantly growth parameters. This reconfirmed the role of nitrogen in promoting vigorous vegetative growth in leafy vegetables (Tisdale and Nelson, 1990).

Table 4: Main effect of pinching and poultry manure application rates on numbers of branches of *C. olitorius* in weeks after planting

	Number of branches in weeks after planting				
Pinching	4	6	8	10	12
P_0	1.90	6.10	15.60	31.67	58.50
P_2	2.40	7.13	17.47	36.00	66.70
P_4	2.70	7.47	20.3	37.90	67.70
P_6	3.47	8.07	21.7	38.17	70.30
LSD (0.05)	1.045	1.914	3.819	5.665	NS
Poultry manure rates (t/ha)					
0	1.96	5.79	17.21	32.62	64.6
4	3.21	8.42	22.38	39.5	69.7
8	2.38	6.5	16.08	33.21	63.8
12	2.17	6.38	14.96	33.08	55.6
16	3.38	8.88	22.83	41.25	75.4
LSD (0.05)	1.168	2.14	4.27	NS	NS

P_0=no pinching, P_2=pinching @2nd node, P_4=pinching @4th node and P_6=pinching @6th node. Non-significant.

Main effect of pinching and poultry manure on stem girth of *C. olitoriu* at 4, 6, 8, 10 and 12 WAP is presented in Table 5. The stem girth was influenced significantly ($p < 0.05$) by pinching across the sampling weeks. No pinching (P_0) had the widest stem at 4, 6, 8, 10 and 12 WAP with respective values of 0.71, 0.97, 1.47, 2.06 and 2.75 cm. Plants pinched at P_2 gave the tiniest stem of 0.523, 0.723, 1.09, 1.617 and 2.19 cm across the sampling weeks. The differences in the stem girth might be due to the differences in the level of pinching. Stems increased with regards to the level at which plants were pinched. Beura *et al.* (2016) stated that the removal of the main growing point stimulates the development of axillary buds down the stem which grow into lateral branches, thus causing the plant to bush out. This finding contradicts the result obtained in this work. Pinching also increases main stem diameter making them solid (Rowell, 1981), this negates the findings in this study.

Poultry manure asserted significant influence on stem girth of *C. olitorius* at 4, 6, 8, 10 and 12 WAP with 16t/ha having the broadest stem of 0.754, 0.917, 1.367, 1.904 and 2.554 cm. At 10 WAP, 4 t/ha of PM had the same value (1.904 cm) with what was recorded in 16t/ha of PM. However, the tiniest stem (0.513, 0.758, 1.112, 1.621 and 2.225 cm) was recorded in plants grown with no PM at 4, 6, 8, 10 and 12 WAP. Increased stem girth of *C. olitorius* was observed when PM was incorporated in the soil at 16t/ha than other treatments, this implied that this rate provided sufficient nutrients to *C. olitorius* plants since the plants are solely dependent on the nutrient given. The results obtained in this work corroborates with the findings of Baiyeri*et al.* (2015) who reported that application of the highest rate of organic manure enhanced growth parameters in Moringa grown as pot plant in Nsukka.

Table 5: Main effect of pinching and poultry manure on stem girth (cm) of *C. olitorius*in weeks after planting

	Stem girth in weeks after planting				
Pinching	4	6	8	10	12
P_0	0.717	0.97	1.47	2.067	2.75
P_2	0.523	0.723	1.09	1.617	2.19
P_4	0.577	0.78	1.177	1.743	2.323
P_6	0.71	0.907	1.303	1.847	2.37
LSD (0.05)	0.1172	0.1276	0.1489	0.1781	0.192
Poultry manure rates (t/ha)					
0	0.513	0.758	1.112	1.621	2.225
4	0.638	0.875	1.225	1.904	2.454
8	0.671	0.913	1.304	1.842	2.337
12	0.583	0.763	1.292	1.821	2.471
16	0.754	0.917	1.367	1.904	2.554
LSD (0.05)	0.1311	0.1427	0.1665	0.1991	0.2146

P_0=no pinching, P_2=pinching @2nd node, P_4=pinching @4th node and P_6=pinching @6th node. Non-significant.

Main effect of pinching and poultry manure application rates on fresh weight of shoot, fresh root weight, total fresh weight, dry matter and dry matter distribution is shown in Table 6. Pinching asserted significant ($p < 0.05$) influence on fresh weight of root, dry weight of shoot, root, total weight, shoot/root ratio and dry matter distribution to the root. However, fresh weight of shoot, total fresh weight and dry matter distribution to the shoot were not different statistically. Pinching at P_4 gave the heaviest root weight of 7.52. Plants pinched at P_2 had the lightest weight (6.57 g) while P_4 had the tendency to produce the highest shoot weight (54.4 g) and total fresh weight (62.00 g). No pinching (P_0) gave the least (42.8 and 49.9 g). Interestingly, P_6out-performed the other pinching levels in terms of dry shoot weight (17.97 g), total dry weight (20.97 g) and shoot/root ratio (6.18 g). Plants grown with P_0 had the least values for dry shoot weight (14.27 g), total dry weight (17.37 g) and shoot/root ratio (4.98 g). On the other hand, P_0, P_4 and P_6 had the heaviest dry root weight of 3.00g. Pinching at P_2 gave the least (2.67 g). As the plant is pinched, the apical dominance is broken, and the extra energy is diverted into the production of more branches resulting to heaviest fresh and dry weight of *C. olitorius*. Similar results were observed by Pushkar and Singh (2012) in African marigold. Kedar *et al.* (2021) reported similar results in Chrysanthemum plants.

Poultry manure had significant effect on fresh weight of root, dry weight of shoot, root, total weight, shoot/root ratio and dry matter distribution to the root. Poultry manure only affected fresh weight of root but fresh weight of shoot and total fresh weight did not differ. Plants that received 16t/ha of PM had the highest value (11.62g) for fresh root weight, it also had the tendency to produce more fresh weight of the shoot and total fresh weight of 60.20 and 71.90 g, respectively. Application of 12t/ha gave the least root weight (5.21 g), fresh shoot weight (31.40) and total fresh weight (35.50 g). Poultry manure applied at 8 t/ha gave the highest dry weight of shoot (19.08 g) while at 12 t/ha recorded the least (10.04 g). Dry root weight was heaviest when PM was applied at 16t/ha with 4.00 g while PM applied at 4 t/ha had the lightest weight of 2.33 g. Plants treated with 16t/ha of PM produced the highest value (12.75 g) with respect to total dry weight. The least value (12.42 g) was attributed to plants grown with 12t/ha of PM. Plants that received 4 t/ha had the highest shoot/root ratio of 7.72 g while application of 12t/ha of PM had the lowest (3.97 g). Dry matter distribution to the root was highest in plants grown with 12 t/ha of PM (20.93 g). However, plants that received 4t/ha of PM had the least (12.11 g). Soil amendment using 16t/ha of PM took the lead in most of the traits taken, this could be that this rate supplied the required amount of nutrient needed by *C. olitorius* for growth and development. Soil amendment using organic manure increased vegetative and dry matter yield of Moringa in the nursery (Adebayo *et al.*, 2011). Adediran *et al.* (2015); Qulsum*et al.* (2020) reported similar results in *C. olitoriu*. Generally, dry matter distribution pattern of *C. olitorius* was accredited to the above ground portion of the plant. Dry matter distribution pattern of *C. olitorius* plants in which 12.11– 20.93% of photo-assimilates went to the roots contradicts the result obtained with tamarind seedlings as reported by Ugese (2010). This result of this study is in line with the reports of Baiyeri (2003) in cashew and African breadfruit where dry matter allocation to the root was less than 20% in both species. In this work, proportion of *C. olitorius* dry matter was partitioned to the shoot. This could be that *C. olitorius* seedlings focus more on shoot development at the early stage to form canopy as a survival strategy in the harsh weather condition.

Table 6: Main effect of pinching and poultry manure application rates on fresh weight of shoot, fresh weight of root, total fresh weight, dry matter and dry matter distribution of *C. olitorius*

Pinching	FWS	FWR	TFW	DWS	DWR	TDW	S:R RATIO	% DMDS	% DMDR
P_0	42.8	7.37	49.9	14.27	3.03	17.37	4.98	82.5	17.35
P_2	49.6	6.57	56.1	14.97	2.67	17.57	6.02	79.9	15.96
P_4	53.9	7.53	61.4	17.83	3.03	20.8	6.17	86.3	15.54
P_6	54.4	7.43	62	17.97	3.03	20.97	6.18	85.4	14.9
LSD (0.05)	NS	2.315	NS	3.772	0.68	4.234	0.997	NS	2.322
Poultry manure rates (t/ha)									
0	53.7	7.12	60.8	15.54	2.5	18.25	6.79	85.5	13.83
4	53.2	5.42	59.5	17.83	2.33	20.17	7.72	88	12.11
8	52.3	6.75	59	19.08	3.29	22.29	5.73	85.5	15.09
12	31.4	5.21	35.5	10.04	2.58	12.42	3.97	76.2	20.93
16	60.2	11.62	71.9	18.79	4.0	22.75	4.98	82.5	17.74
LSD (0.05)	NS	2.588	NS	4.217	0.76	4.734	1.114	NS	2.596

P_0=no pinching, P_2=pinching @2nd node, P_4=pinching @4th node and P_6=pinching @6th node. Non-significant.

CONCLUSION

Pinching and poultry manure influenced some of the growth and dry matter yield of *C. olitorius*. Pinched at P_6 (pinching at 6th node) and poultry manure applied to*C. olitorius*at 16 t/ha enhance growth and dry matter yield of *C. olitorius*. Therefore, P_6 (Pinching at 6th node) and application of poultry manure at 16 t/ha is recommended for optimum production of *C. olitorius* in homes**.**

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