

Full Length Research Paper

Effects of number of nodes per cutting and goat dung on the growth of Dumb cane (*Dieffenbachia seguine* JACQ) under screen-house conditions in Nigeria

Ayodele O.P.*, Ewulo B.S. and Adenawoola A.R.

Department of Crop, Soil and Pest Management, Federal University of Technology, P.M.B. 704, Akure, Ondo State, Nigeria.

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Two identical completely randomized screen house experiments were undertaken in the Department of Crop, Soil and Pest Management, Federal University of Technology, Akure, Nigeria to evaluate the growth response of Dumb cane (*Dieffenbachia seguine*) to different cutting nodes and potting media made with varying levels of goat dung. In preparing the media, top soil, collected from the dept of 0-15cm and sand (grade used for plastering houses) were both sieved to remove stones, pebbles and other foreign materials and then mixed together in ratio 3:1. The goat dung was air dried before the application at various levels. Treatments involved the use of two and three nodes per cutting in factorial combination with five levels of goat dung at 0, 10, 20, 30, and 40% (by volume of goat dung). The use of three nodes per cutting resulted to higher shoot and root weights than that of two nodes. Increase in goat dung level above 10% led to reduction in number of leaves produced, average leaf area and the weights of both the shoot and root while cuttings with three nodes planted in 10% goat dung tended to put up the best growth performance. Application of high rates of goat dung irrespective of the number of nodes per cutting is not advisable for the growth of *D. seguine*.

Keywords: Nodes, goat dung, potting media, dumb cane.

INTRODUCTION

Dumb cane (*Dieffenbachia seguine*) is one of the ornamental, potted plants that are widely grown in the tropical regions of the world. Due to the poisonous sap of *Dieffenbachia* species on the mouth and throat, roaming animals around houses in the developing countries cannot destroy them. The large and highly decorative leaves of this plant made it a great favorite with interior designers (Hessayon, 2001), that uses large ones as solitary specimen plants and smaller samples as a key part of plant groups. These attributes make it one of the most popular foliage house plants in the world.

This important plant is mainly grown using cuttings of varied number of nodes and on different media in Nigeria, whereas the size of stem cutting is a factor that affects

the growth of plants especially at the seedling stage. Adenawoola et al. (2001) and Hartman et al. (2002), have found that the composition of a growth medium has significant effect on plant growth. A lot of research has been conducted on potting media made with different organic and inorganic fertilizer materials for the propagation of some plants (Hew and Hee, 1990; Robert et al., 1996). However, not much work has been done on the growth response of *D. seguine* to different number of nodes and paucity of information also exist on studies aimed at improving the growth of this plant using media containing goat dung, which is regarded as good organic manure as a result of its high nutrient composition (Devendra and Mc Leroy, 1992; Raymond and Roy, 1992). Therefore this project was designed as a two-factor experiment to determine the growth response of *D. seguine* to different cutting nodes and potting media made with varying levels of goat dung.

*Corresponding Author E-mail: olatuna@gmail.com

Table 1. Nutrient status of the media containing various levels (% by volume) of goat dung and goat dung alone

Goat dung by volume)	pH	C:N	Organic matter (%)	Nitrogen (%)	Phosphorus mg/kg	Potassium (Cmol/kg)	Calcium (Cmol/kg)	Magnesium (Cmol/kg)	Sodium (Cmol/kg)
0	7.1	16.91	3.5	0.12	12.60	1.74	4.00	1.40	1.30
10	8.0	17.31	4.7	0.16	32.76	1.82	4.50	2.00	1.83
20	9.0	17.05	6.5	0.22	38.74	1.87	5.50	2.50	2.13
30	9.2	17.15	8.0	0.27	49.56	2.43	6.00	3.50	2.43
40	9.5	16.66	8.4	0.27	54.60	2.62	8.00	8.70	2.74
Goat dung alone	11.4	28:83	85.1	1.71	0.41(%)	1.66 (%)	0.32 (%)	0.24 (%)	0.23 (%)

Table 2. Effect of number of nodes on the growth of *Dieffenbachia seguine* at 24WAP

Growth parameters	Number of nodes			
	Experiment 1		Experiment 2	
	Two	Three	Two	Three
Number of Sprouts/plant	1.1a	1.1a	1.0e	1.2e
Number of leaves / plant	4.7a	4.7a	4.5e	6.1e
Average leaf area cm ²	171.7a	168.9a	175.1e	200.9e
Shoot fresh weight (gm/plant)	37.2a	38.7a	36.7f	60.6e
Shoot dry weight (gm/plant)	3.4a	3.8a	3.7f	6.1e
Root fresh weight (gm/plant)	10.5a	13.8a	10.0f	19.5e
Root dry weight (gm/plant)	1.3a	1.5a	1.2f	2.3e

Means without similar alphabets in the same row (under each Experiment) differ significantly ($P \geq 0.05$)

MATERIALS AND METHOD

The study involved two identical, completely randomized screen-house experiments (Experiments 1 and 2) conducted simultaneously in the Department of Crop, Soil and Pest Management, Federal University of Technology, Akure, (7° 16' N, 5° 12' E), located in the rain forest zone of southwestern Nigeria. The experiment was a 2 x 5 factorial experiment with five replicates. Two levels of stem cuttings (Two and Three nodes per cutting of *D. seguine*) were combined with five levels of goat dung at 0 (control), 10, 20, 30 and 40% by volume.

In preparing the media, top soil, collected from the dept of 0-15cm and sand (grade used for plastering houses) were both sieved to remove stones, pebbles and other foreign materials and then mixed together in ratio 3:1. The goat dung was air dried before the application at various levels. The nutrient status of both the goat dung and the different media were presented in Table 1. These media were used to fill 400 gauge black polythene bags measuring 40cm wide and 35cm deep (the type used for production of oil palm seedlings). The cuttings were prepared by uprooting the plants from a garden early in the morning and the subsequent cutting and

planting were done almost immediately to minimize plant stress.

Watering of the potted plants and hand pulling of weeds were the major post-planting operations embarked on during the experiment. No incidence of pests and diseases was recorded. Data collection started from the 4th week after planting (WAP) and continued at an interval of four weeks up till 24th WAP. Parameters considered were: number of leaves per plants, average leaf area, number of sprouts per plant, and both the fresh and dry weights of shoot and root. Data collected were subjected to analysis of variance (ANOVA) as outlined by Little and Hills (1972) and means were separated using the Duncan's News Multiple Range Test.

RESULTS

Effect of number of nodes per cutting on the growth of *D. seguine*

Table 2 showed the effect of number of nodes, regardless of goat dung, on the growth of *D. seguine* at 24 WAP. In experiment 1, number of nodes per cutting

Table 3. Effect of goat dung on number of leaves produced by *Dieffenbachia seguine*

Goat dung (% by volume)	Weeks after planting									
	Experiment 1					Experiment 2				
	8	12	16	20	24	8	12	16	18	24
0	0.1b	2.7a	4.0a	5.5ab	6.2a	0.3g	2.7g	3.9g	5.0gh	6.5gh
10	0.5a	2.5a	4.2a	5.7a	6.8a	0.4g	2.9g	4.5g	5.7g	7.2g
20	0.0b	0.8b	1.8b	3.7b	4.5ab	0.2g	2.1g	3.7g	4.5gh	5.2gh
30	0.0b	0.1c	0.8bc	1.7c	3.2b	0.0g	0.5h	1.4g	2.6i	3.7i
40	0.0b	0.1c	0.6c	1.9c	2.7b	0.0g	0.8h	1.80g	3.3hi	4.0hi

Means without similar alphabets in the same column differ significantly ($P \geq 0.05$)

Table 4. Effect of goat dung on the growth of *Dieffenbachia seguine* at 24WAP

Growth parameters	Goat dung (% by volume)									
	Experiment 1					Experiment 2				
	0	10	20	30	40	0	10	20	30	40
No of sprouts/plant	1.0a	1.0a	1.3a	1.0a	1.2a	1.2g	1.2g	1.2g	1.0g	1.0g
Average leaf area (cm ²)	212.2ab	237.5a	181.0b	122.7c	98.0d	183.5gh	229.3g	223.3g	138.3h	165.7gh
Shoot fresh weight (gm/plant)	58.3a	70.7a	28.4b	18.2b	14.0b	60.6g	73.1g	62.6g	25.1h	21.7h
Shoot dry weight (gm/plant)	6.3a	7.2a	1.8b	1.6b	1.2b	7.2g	7.3g	6.3g	2.0h	1.8h
Root fresh weight (gm/plant)	24.1a	26.7a	4.1b	3.0b	2.9b	20.9g	20.8g	22.2g	6.5h	3.4h
Root dry weight (gm/plant)	2.9a	2.7a	0.6b	0.4b	0.4b	3.2g	2.1g	2.3g	0.7h	0.7h

Means without similar alphabets in the same row (under each Experiment) differ significantly ($P \geq 0.05$)

did not significantly affect the number of sprouts, number of leaves per plant and average leaf area of this plant. Both the fresh and dry weights of shoot and root were slightly increased by three nodes per plant. However, number of sprouts, number of leaves per plant and average leaf area were a little bit higher at three nodes whereas the fresh and dry weights of shoot and root were significantly higher at three nodes per cutting than at two nodes in Experiment 2.

Effects of goat dung on the growth of *Dieffenbachia seguine*

Regardless of number of nodes per cutting, different levels of goat dung significantly affected the growth of *D. seguine* in both experiments (Table 3 and 4). It could be observed from Table 3 that the number of leaves produced when goat dung was applied at the rate of 10% by volume was found to be highest from the 16th WAP in

Experiment 1 and throughout the data collection period in Experiment 2, though the differences were not significant when compared with control. Application of goat dung especially at higher rates of 30% and 40% by volume led to a significantly reduced number of leaves as compared with control throughout the data collection period in both experiments.

Table 4 showed the effects of goat dung on some growth characteristics such as number of sprouts per plant, average leaf area and the fresh and dry weights of both the shoot and root of *D. seguine*. Application of goat dung only slightly affected the number of sprouts per plant in both experiments while the other growth characteristics were significantly ($P = 0.05$) affected. In experiment 1, application at the rate of 10% by volume produced the highest leaf area, though the difference was not significant when compared with the control, but was great when compared with the application at the rates of 20, 30, and 40 respectively. The values obtained for these growth characteristics were similar when goat dung

Table 5. Effect of number of nodes and goat dung on number of leaves produced by *Dieffenbachia seguine*

Treatments		Weeks after planting									
No of nodes	Goat dung (% by volume)	Experiment 1					Experiment 2				
		8	12	16	20	24	8	12	16	20	24
Two	0	0.2b	2.4a	3.6ab	5.0a	6.3ab	0.2g	1.4ij	2.4i	3.8gh	5.7g
	10	0.6a	2.4a	4.0a	5.6a	6.7a	0.2g	2.2hi	3.8h	5.4g	6.7g
	20	0.0b	1.0b	2.2bc	4.0a	4.0ab	0.2g	1.4ij	2.4i	3.6gh	3.7gh
	30	0.0b	0.0c	0.6cd	1.2b	3.7b	0.0g	0.2k	0.8j	1.8h	2.0h
	40	0.0b	0.0c	0.25d	1.5b	2.7c	0.0g	1.3jk	2.3i	3.8gh	4.7g
Three	0	0.0b	3.0a	4.4a	6.0a	6.0ab	0.4g	4.0g	5.4g	4.6g	7.3g
	10	0.4a	2.6a	4.4a	5.8a	7.0a	0.6g	3.6g	5.2g	6.0g	7.7g
	20	0.0b	0.6bc	1.4c	3.4a	5.0ab	0.2g	2.8hi	5.0gh	5.4g	6.7g
	30	0.0b	0.2bc	1.1cd	2.2ab	2.7c	0.0g	0.8jk	2.0i	3.4gh	5.3g
	40	0.0b	0.2bc	0.8cd	2.2ab	2.7c	0.0g	0.4jk	1.4j	3.0gh	3.3gh

Means without similar alphabets in the same column differ significantly ($P \geq 0.05$)

was applied at the rates of 0, 10, and 20% by volume but significantly higher than when applied at the rates of 30 and 40% in Experiment 2.

Effects of number of nodes and goat dung on the growth of *D. seguine*

The effect of goat dung and number of nodes per cutting was significant on the number of leaves produced by *D. seguine* from 8 to 24 WAP in Experiment 1 and from 12 to 24 WAP in Experiment 2 (Table 5). In both experiments, treatments involving the use of three nodes per cutting, planted on media containing 0% and 10% by volume of goat dung were statistically the same except at 8 WAP in experiment 1. Whereas both two and three nodes per cutting planted in bags containing 30 and 40% by volume of goat dung had the least number of leaves in both experiments. At 24 WAP, cuttings with two nodes planted in bags that received 40% and cuttings with three nodes on 30 and 40% produced the same and lowest leaves in Experiment 1. Cuttings with two nodes in poly bags containing 30% goat dung tended to produce the least values of leaves in Experiment 2.

Table 6 and 7 (Experiments 1 and 2 respectively) show the effects of number of nodes per cutting and goat dung on the average leaf area, number of sprouts per plant and both the fresh and dry weights of shoot and root of *D. seguine* at 24 WAP. The treatment involving two nodes per cutting and 10% goat manure produced the largest leaf area though the difference was not significant when compared with treatments involving three nodes at 10%, two and three nodes at 0% and at 20% respectively, while the least values were respectively obtained for two and three nodes planted on bags containing 40% by volume of goat dung (Experiment 1). Number of sprouts produced by *D.*

seguine was not significantly affected by the treatment combinations. However, both the weights of shoot and root were significantly ($P = 0.05$) affected by these treatment combinations: cuttings with two and three nodes planted on media containing 20, 30 and 40% by volume of goat dung (table 6). This same trend was also observed in Experiment 2 (table 7) except that cuttings with two nodes planted on medium containing 30% goat dung produced the least values for all the parameters considered.

DISCUSSION

The results of this experiment clearly demonstrated that number of nodes per cutting and goat dung had effect on the growth performance of *D. seguine*. The use of three nodes per cutting resulted to higher shoot and root weights than that of two nodes. This agrees with the findings of Gurnah (1974) for cassava. This better performance of three nodes per cutting could be as a result of production of more roots (table 2) resulting from burying more nodes in the growing medium as reported by Donkor (1971).

Result obtained on the effect of goat dung on the growth of *D. seguine* corroborates earlier suggestion by Hartmann et al. (2002) that compost should not be more than 30 percent of the volume of the mixture. Laboratory analysis of the growing media revealed that with increase in level of goat dung, there is a concomitant increase in the nutrient composition of the media. However, increasing the goat dung level above 10% resulted in reduction of virtually all the growth parameters considered despite the high nutrient level in the media. This is inconsistency with the findings of Pitala and Sivasupiramaniam (1994) for production of potato. This negative influence could be due to high pH levels ema-

Table 6. Effect of number of nodes and goat dung on growth of *Dieffenbachia seguine* at 24WAP (Experiment 1)

Treatments		Growth Parameters					
No of nodes	Goat dung (% by volume)	Average leaf area (cm ²)	No of sprouts/plant	Shoot weight (g/plant)		Root weight (g/plant)	
				Fresh	Dry	Fresh	Dry
Two	0	217.7ab	1.0a	59.1a	6.3a	20.4a	2.7a
	10	250.0a	1.0a	64.7a	6.9a	21.8a	2.3a
	20	168.3abc	1.3a	26.8b	0.9b	5.1b	0.7b
	30	132.7bcd	1.0a	25.2b	2.1b	3.8b	0.5b
	40	89.7d	1.3a	10.1b	0.8b	1.5b	0.3b
Three	0	206.7ab	1.0a	57.6a	6.3a	27.9a	3.1a
	10	225.0a	1.0a	76.7a	7.5a	31.6a	3.1a
	20	193.7abc	1.3a	29.9b	2.7b	3.0b	0.5b
	30	112.7cd	1.0a	11.3b	1.0b	2.0b	0.3b
	40	106.3d	1.0a	17.9b	1.6b	4.4b	0.5b

Means without similar alphabets in the same column differ significantly ($P \geq 0.05$)

Table 7. Effect of number of nodes and goat dung on growth of *Dieffenbachia seguine* at 24WAP (Experiment 2)

Treatments		Growth Parameters					
No of nodes	Goat dung (% by volume)	Average leaf area (cm ²)	No of sprouts/plant	Shoot weight (g/plant)		Root weight (g/plant)	
				Fresh	Dry	Fresh	Dry
Two	0	163.7abc	1.0a	49.4ab	6.3abcd	17.2ab	2.0bc
	10	236.7a	1.0a	60.7ab	5.5abcd	14.5ab	1.7bc
	20	188.7ab	1.3a	41.8bc	3.9bcde	14.5ab	1.8bc
	30	81.0c	0.7a	5.7c	0.5f	0.3b	0.1c
	40	205.7ab	1.0a	25.8c	2.2def	3.3b	0.6bc
Three	0	203.3ab	1.3a	71.8ab	8.0abc	24.6a	4.43a
	10	222.0ab	1.3a	85.6a	9.1a	27.1a	2.6ab
	20	258.0a	1.0a	83.4ab	8.6ab	29.9a	2.8ab
	30	195.7ab	1.3a	44.5ab	3.4cde	12.8ab	1.3bc
	40	125.7bc	1.0a	17.6c	1.5ef	3.4b	0.9bc

Means without similar alphabets in the same column differ significantly ($P \geq 0.05$)

nating from the addition of goat dung. With increase in pH, there is nutrient imbalance and negative interaction in plant due to excess supply of some nutrients such as potassium (Owolabi et al., 2003) and could cause some soil nutrients especially phosphorus not to be available (Brady, 1987). Therefore, it is reasonable to assume that the retardation in growth of *D. seguine* as a result of application of goat dung at higher rates (30 and 40% by volume) is due to high pH level. It could therefore be

suggested that the use of goat dung should be experimented at lower rates.

Statistical analysis showed no significant interaction between number of nodes per cutting and goat dung levels. Though cuttings with three nodes planted in 10% goat dung tended to perform best in terms of number of leaves, and weights of shoot and root at 24 WAP, but the difference was not significant when compared with cuttings with either two nodes planted in media con-

taining 0, and 10% or three nodes in bags containing 0 and 20% by volume of goat dung. It is opined that the application of high rates of goat dung irrespective of the number of nodes per cutting is not advisable for the growth of *D. seguine*

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