Journal of Research in Forestry, Wildlife & Environment Vol. 11(3) September, 2019
http://www.ajol.info/index.php/jrfwe
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E-mail:jfewr@yahoo.com
ISBN: 2141 – 1778
Awotoye, 2019

STUDY ON THE INFLUENCE OF SELECTED ORGANIC MANURES ON THE EARLY GROWTH OF *Senna fistula* Linn

Awotoye, O. O.

Department of Forestry Technology, Federal College of Forestry, Ibadan, Oyo State. Nigeria

***Correspondent author:** *jumoceline81@gmail.com;* **08036573330**

ABSTRACT

The study assessed the manuring potentials of Chromolaena odorata and composted kitchen waste on the growth of Senna fistula seedlings. Germination was observed and assessment of growth parameters commenced two weeks after transplanting and was done weekly for 12 weeks. Seedling height, stem diameter, leaf production and leaf area were measured. Data were analyzed using ANOVA at $\alpha_{0.05}$. Results showed that T_8 (80g of composted kitchen waste + 1.5 kg of top soil) had the highest performance in terms of plant height with 8.08 cm while T_4 (80g of Chromolaena odorata leaf powder + 1.5 kg of top soil) had the best performance with mean value 1.44 mm for stem diameter. The highest leaf production was observed on seedlings raised on T_8 (80 g of composted kitchen waste + 1.5kg of top soil) with 17.00. However, for leaf area, T_8 (80g of composted kitchen waste + 1.5kg of top soil) had the best performance with mean value of 8.00 cm^2. The organic manure used for the study had an excellent performance on the growth of Senna fistula seedlings. It is therefore, recommended that composted kitchen waste and Chromoleana odorata leaf powder be adopted for raising seedlings of Senna fistula at the nursery stage.

Keywords: *Chromoleana odorata,* Compost, Growth, Manure, Seedlings, *Senna fistula,*

INTRODUCTION

Senna fistula is an exotic species that command good market price. This is due to its vast economic uses. It is popularly known as golden shower tree which belong to the family Fabaceae and a high valued species in terms of its aesthetic purposes (Willis 2001). *Senna fistula* is widely grown as an ornamental plant in tropical and sub-tropical areas and it grows well in dry climate with relatively drought tolerant ability. The species produces flowers which are golden yellow and hangs its showers bunch of up to 4cm long hence the name golden shower tree (Murali, 1993). The plant has been used extensively in the folklore medicine for the treatment of variety of diseases such as purgative (Kasuko and Nagayo, 2001), menstrual disorder (Bhaktal *et al*., 2001), skin diseases, leprosy, malaria, rheumatism etc. (Willis, 2001).

Chromolaena odorata (Siam weed) is a perennial shrub forming dense tangled bushes up to 3m in height. Although, it re-sprouts from its stumps immediately after rains, the ability coupled with its fast growth rate enables it to compete well with other plants. It provides a vegetative cover that protects the soil surface against erosive action of rain and wind and when it shed its leaves or when the entire plant dies and decays it adds organic matter to the soil (Nwaokoro and Omolaja, 2000).

Compost on the other hand, are organic materials which have been decomposed and recycled as a fertilizer and soil amendment. It is a key ingredient in organic farming. Compost is added to the soil for several reasons. It improves the physical conditions of the soil. It also keeps up the level of humus in the soil and maintains the best conditions for the activities of soil organisms (Radovich, 2011). In addition, it makes up for the plant nutrients which have been removed by crops or lost by leaching and soil erosion. The compost adds air space to the soil and also alleviate compacted soil conditions. However, in most

developing countries, many farmers find it difficult in making use of these materials hence this study aimed at investigating the influence of organic manure on early growth of *Senna fistula*.

MATERIALS AND METHODS

Study Area

The experiment was carried out in Federal College of Forestry, Ibadan. The college is located in Ibadan North West Local Government Area of Oyo state at Latitude $7^0$26'N and Longitude 3^0 36'E of the Greenwich meridian. It has an annual rainfall of about 1400-1500mm and average relative humidity of about 65%. The average temperature is 37.2^0C. There are two distinct seasons that are notable in the area which are dry and wet (raining) season (FRIN 2019).

Procedure

Forty five seeds of *Senna fistula* were collected from a mother tree within the premises of Federal College of Forestry, Ibadan. The seeds were soaked in Conc. H_2SO_4 (to break its dormancy) for 5 mins after which they were thoroughly washed under running water to remove all traces of the acid before they were sown into germination box filled with sterilized river sand. Watering was done twice a day. After germination (8days), the 45 seedlings were carefully pricked from the germination basket and then transplanted into the polythene pots containing various treatments. The readings were taken every week for 12 weeks.

Compost preparation

The kitchen waste were collected and put into a perforated bucket with lid and thick black polythene bag. The hole was to allow water to drain out as well as allow the free flow of air while the polythene bag was to help provide adequate heat for decomposition process to take place. The waste was also watered (to keep it moist) and mixed with garden fork twice in a week so that complete decomposition can take place. The decomposition process was achieved after 2 months of preparation.

Green manure preparation

Leaves of *Chromolaena odorata* were collected from the College Premises, these were chopped with a knife and then spread out (to air dry) in a cool dry place for 4 weeks. The dried leaves were then grinded into powder form using a grinding machine.

Treatments

The treatments were: T_1 (1.5kg of top soil + 20g of *Chromolaena odorata* leaf powder), T_2 (1.5kg of top soil + 40g of *Chromolaena odorata* leaf powder), T_3 (1.5kg of top soil + 60g of *Chromolaena odorata* leaf powder), T_4 (1.5kg of top soil + 80g of *Chromolaena odorata* leaf powder), T_5 (1.5kg of top soil + 20g of kitchen waste compost), T_6 (1.5kg of top soil + 40g of kitchen waste compost), T_7 (1.5kg of top soil + 60g of kitchen waste compost), T_8 (1.5kg of top soil + 80g of kitchen waste compost), T_9 (1.5kg of top soil ,control)

Experimental design

The experiment was arranged in a Completely Randomized Design (CRD) with nine (9) treatments and five (5) replicates. Stem diameter (mm), seedlings height (cm), leaf production and leaf area.

Data Analysis

Data were analysed using ANOVA and the means were separated using Duncan multiple range test at 5% level of probability.

RESULT

Chemical analysis of top soil, compost and green manure

The characteristics of soils play a great role in the growth of plants. For plants to grow, the soil must provide a satisfactory environment (basic nutrients) that enable growth. From the result, it was indicated that nitrogen (N), potassium (K) and Phosphorus (P) are 0.19%, 0.46 cmol/kg and 12.40 mg/kg respectively. The pH level of the soil was observed to be closer to neutral level showing that the soil is good for planting and would be able to support plant growth (Table 1).

Table 1: Chemical analysis of top soil, compost and green manure

Parameters	Top soil	Compost	Green manure
Exchangeable Na (cmol/kg)	0.09	-	
Exchangeable Ca (cmol/kg)	1.29	0.28	
Exchangeable K (cmol/kg)	0.46	0.49	35
Exchangeable Mg (cmol/kg)	0.47	0.33	
ECEC	3.15		
% Organic C	0.79	26.78	
% N	0.19	2.28	1.51
% O. M.	-	46.22	
Average P (mg/kg)	12.40	0.33	45.2
pH	6.57		
Cu (mg/kg)	1.41	-	
Zn (mg/kg)	117.6	-	
Pb (ppm)	6.18	11.78	
Fe (mg/kg)	125.9		
Mn (mg/kg)	70.7	31.28	
Sand (%)	70	-	
Silt (%)	13	-	
Clay (%)	17	-	

Effect of different organic manures on seedlings height (cm), diameter (cm), leaf production and leaf area of *Senna fistula*

The effect of different organic manures on seedlings height (cm), diameter (cm), leaf production and leaf area of *Senna fistula* shows in Table 2.

The result on seedling height shows that T_8 (80g of compost + 1.5kg of top soil) had the best performance with 8.08 cm. This was closely followed by T_4 (80g of *Chromolaena odorata* leaf powder + 1.5kg of top soil) with 7.93 cm. However, the least performance (7.22 cm) was recorded in T_5 (20g of compost + 1.5kg of top soil). This is an indication that the presence of organic manure in the soil can enhance better performance of plants height. There was no significant difference among the treatments at $p<0.05$ (Table 3).

However, the result on stem diameter revealed that T_4 (80g of *Chromolaena odorata* leaf powder + 1.5kg of top soil) had the best performance with mean value 1.44 mm. This was followed by T_5 (20g of compost + 1.5kg of top soil) with 1.41 mm. However, T_7 (60g of compost + 1.5kg of top soil) had the least performance in stem diameter with 1.25 mm. This clearly showed that *Chromolaena odorata* leaf powder and the composted kitchen waste have effect on the stem diameter of the species. There was no significant difference ($p<0.05$) in stem diameter of the *Senna fistula* grown on varying levels of organic manure (Table 3).

In addition, the results further indicated that T_8 (80g of composted kitchen waste + 1.5kg of top soil) produced the highest number of leaves with 16.55. This was followed by T_4 (80g of *Chromolaena odorata* leaf powder + 1.5g of top soil) with 16.48 while T_5 (20g of compost + 1.5kg of top soil) had the least leaf production with mean value of 14.58 implying that higher quantities of organic manures had effect on the leaf production of *Senna fistula seedlings*. There was significant difference among treatments at $p<0.05$probability level (Table 3).

Finally, T_8 (80g of composted kitchen waste + 1.5kg of top soil) produced the highest leaf area with 8.00 cm^2. This was followed by T_7 (60g of compost + 1.5kg of top soil) with 7.00 cm^2 while T_9 (1.5kg of top soil only) had the least leaf area with mean value of 3.67 cm^2 implying that higher quantities of organic manures had effect on the leaf area of *Senna fistula* seedlings. However, there was significant difference among treatments at $p<0.05$ probability level (Table 3).

Table 2: Effect of different organic manures on seedling height, stem diameter, leaf production and leaf area of *Senna fistula* seedlings

Treatments	Seedling height (cm)	Stem diameter (mm)	Leaf production	Leaf area (cm^2)
T_1	7.31a	1.36a	16.38ab	5.08ab
T_2	7.25a	1.27a	14.65a	5.52ab
T_3	7.77a	1.35a	15.15a	5.44ab
T_4	7.93a	1.44a	16.48ab	6.21c
T_5	7.22a	1.41a	14.58a	4.26a
T_6	7.65a	1.34a	15.66ab	5.15ab
T_7	7.64a	1.25a	15.83a	7.00c
T_8	8.08a	1.36a	16.55ab	8.00c
T_9	7.54a	1.40a	15.03a	3.67a

Table 3: Analysis of variance for the effect of different organic manures on seedling height, stem diameter, leaf production and leaf area of *Senna fistula* seedlings

Sources of variation	SS	Df	MS	F	p-value
Seedlings height (cm)					
Treatments	17.13	8	2.14	0.55	0.81ns
Error	140.81	36	3.91		
Total	157.94	44			
Stem diameter (mm)					
Treatments	0.15	8	0.02	0.06	0.74ns
Error	1.08	36	0.03		
Total	1.24	44			
Leaf production					
Treatments	62.40	8	7.80	1.61	0.16*
Error	174.40	36	4.84		
Total	236.80	44			
Leaf area (cm^2)					
Treatments	148.70	8	8.59	1.74	0.12*
Error	385.51	36	0.71		
Total	534.21	44			

Ns= not significant p >0.05; * significant p>0.05

DISCUSSION

The results on seedling height of *Senna fistula* corroborated the findings of Burkill (1997) that organic manure when applied in adequate proportions could be justified by means of increasing the growth and productivity of plants. Meanwhile, Edward (2003) opined that *Chromolaena odorata* leaf powder (green manure) performed best on the stem diameter of *Albizia lebbeck*. The result of leaf production obtained in this study agreed with the findings of Ulysses (1982) who reported that when organic manure are added to the soil, it reflects in an increase in the leaf production of plants. Santharam (1998) likewise reported an increase in the quantity of organic manure in the soil can lead to an increase in leaf area of *Senna fistula* seedlings.

CONCLUSION

The study revealed the manuring potentials of composted kitchen waste and green manure of *Chromolaena odorata* at varying levels as good source of organic manure for the enhancement of the growth of *Senna fistula* most especially in terms of height stem diameter, leaf production and leaf area at the nursery stage. In addition, it was indicated that the rate at which plants grow is highly determined by the application of optimum manure level. The potential of composting waste to wealth makes it an attractive proposition, by enhancing soil fertility thereby increasing plant

productivity and hence reducing ecological risks of environmental pollution. Therefore, as a means of improving the growth of *Senna fistula* seedlings, it is recommended that composted kitchen waste and *Chromolaena odorata* be adopted for raising the seedlings.

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