IJP (2023), Vol. 10, Issue 3 (Research Article)

IJP International Journal of Pharmacognosy

Received on 27 November 2018; received in revised form, 19 December 2018; accepted, 27 January 2019; published 01 March 2019

COMPARATIVE EFFECT OF COMPOST TEAS ON THE GROWTH PERFORMANCE OF *ANNONA MURICATA* (LINN) SEED LINGS

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Keywords:

Annona muricata seedlings, Compost tea of cow dung, Compost tea of horse dung and Growth characteristics

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ABSTRACT: Compost tea used as organic fertilizer have beneficial effects on plants growth and is considered as a valuable soil amendment with disease suppressing activity. This study was conducted to determine the concentration of Compost tea from two sources organic manures necessary for growth performance of *A. muricata* seedlings. Compost tea from cow dung and horse dung were applied at different concentration rate (25%, 50%, 75% and 100%) in a Completely Randomized Design (CRD) with 9 treatments each replicated seven (7) times. Parameters assessed were plant height, stem diameter and number of leaves of the seedlings. The data collected were subjected to Analysis of Variance (ANOVA) and means were separated using Duncan Multiple Range Test (DMRT) at 5% level of significance. The result showed that there was no significant difference among the treatments at 5% probability level as T_5 (cow dung 100%) had best performance plant height, stem diameter and number of leaves with mean of 11.25cm, 7.57cm and 7.00 at 10th week respectively. It can be concluded that undiluted compost tea of cow dung should be used to raise *A. muricata* for better produce healthy and vigorous seedlings.

INTRODUCTION: Compost tea has long been recognized as potentially valuable in promoting plant growth. Recent innovations in production and application have popularized tea use among food producers, landscape managers and others interested in promoting plant health. This renewed interest in compost tea has made the input fairly controversial and it is often presented as either a “Silver Bullet”, or conversely, “Snake Oil.” Like most other traditional agricultural inputs, compost tea is neither (Pane *et al.*, 2012).

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.10(3).255-59

Article can be accessed online on: www.ijpjournal.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10(3).255-59

Unfortunately, our ability to effectively employ compost teas to their full advantage is severely limited by our poor understanding of the interactions between compost type, crop and environmental factors as they relate to plant yield and quality, particularly under tropical conditions.

These gaps in our knowledge limit the efficacy of compost tea applications on the farms that currently employ this strategy and seriously restrict the extension and adoption of compost tea technology to conventional farms that want to improve the sustainability of their operations. Compost teas are organic solutions obtained by the fermentation of compost in a liquid phase for a few days, with or without aeration. The use of these teas in agriculture is emerging because of their ability to suppress a wide range of both soil and airborne pathogens (Martin, 2014). In this regard, compost teas are viewed as potential alternatives to the use of common synthetic fungicides in response to the increasing need for environmental sustainability of farming and food safety (Pane *et al.*, 2012). The effectiveness of compost teas may vary due to differences in types of compost, management and procedures used for its preparation (Egwunatum and Lane, 2009). Martin (2014) indicated that the best results are obtained when aerated compost teas rather than non-aerated teas are replied, probably because dissolved oxygen supports microbial activity (Arancon *et al.*, 2007). Following Reeve *et al.* (2010), the potential of compost teas for supplementing or substituting other types of fertilizers also seems promising, but further testing under both greenhouse conditions and in the open field is still required.

Composted green wastes are considered advantageous compared with other organic wastes since they present a lower risk of toxicity due to the presence of heavy metals, pollutants, aromatic hydrocarbons, hormones, pharmaceuticals as well as viruses, fecal coli forms and salmonella (Benito *et al.*, 2005; Moretti *et al.*, 2015) and because of the interesting biological activity of these materials (Ros *et al.*, 2005). There is growing interest in the use of organic manures due to soil fertility depletion in most African soils coupled with the scarcity and cost of mineral fertilizers. Thus, the efficient use of nutrients within crop production systems has been the focus of research for several decades. This study; therefore, sought to determine the effects of compost teas on the growth performance of *A. muricata* seedlings with a view to raising the seedlings commercially.

Annona muricata L. is known as sour shop (English), graviola (Portuguese), guana´bana (Latin American Spanish) and other local indigenous names. This plant is species of the genus Annona of the Annonaceae family, order Magnoliales and Division Magnoliophyta (Pinto *et al*., 2005). The genus Annona comprises over 70 species. The sour shop tree is about 5–10 m tall and 15–83 cm in diameter with low branches (Orwa *et al*., 2009). It tends to bloom and fruit most of the year, but there are more defined seasons depending on the altitude (Pinto *et al*., 2005). *A. muricata* has been widely studied in the last decades due to its therapeutic potential. The medicinal uses of the Annonaceae family were reported by Leatemia and Isman, 2004, and since then, this species has attracted the attention due to its bioactivity and toxicity. Ethnobotanical studies have indicated that *A. muricata* has been used as insecticide (Leatemia and Isman, 2004). Fruit juice, leaves or branches of *Annona muricata* has its medicinal values and has been used to treat fever respiratory and malaria (Boyom *et al*., 2011).

MATERIALS AND METHODS:

Study Area: The experiment was carried out at the screen house of Federal College of Forestry, Ibadan. The College is located at Jericho area of Ibadan North West Local Government area of Oyo State, The area is on latitude 7°26’N and longitude 3°54'E of the Greenwich meridian. Its annual rainfall is about 1400 - 1500mm while the average temperature is 31.8°C. The average relative humidity is 65% (FRIN, 2014). Procurement of Materials

Procurement of Materials: The cow dung was collected from Bodija Market, Ibadan, the Horse dung was collected from Polo Club Eleyele Ibdan. the *Annona muricata* seedlings of were collected from Forestry Research Institute of Nigeria, Ibadan (FRIN) while the soil was collected at the *Gmelina arborea* plantation within the premises of Federal College of Forestry, Ibadan.

Preparation of Cow Dung, Horse Dung and Compost Teas: The cow dung and Horse dung were air-dried for 3 weeks and ground into powdery form. Most of the material collected consisted of the leaves and stems of different Cupressaceae species and grass clippings. Some of this waste was turned into compost in piles at the factory. The composting process was carried out using aerated-piles measuring 15 m by 2 m (sides) and 2 m in height. The piles were turned twice per week over 8 weeks and once a week during the rest of the bio-oxidative process. Pile moisture was controlled weekly and the composting process lasted 180 days (Morales-Corts *et al.*, 2014). Compost was mixed with tap water in a ratio of 1:10 (v/v) in polyethylene non-degradable 20L containers at room temperature for a brewing period lasting 14 days. Water had been previously aerated for 8 h to reduce the amount of chlorines present in it. The mixtures was aerated using an aquarium pump (4hrs every day). Next, the liquid was filtered through a double layered cheesecloth to obtain the aerated compost tea (ACT) which was stored in dark polyethylene container at room temperature for 7 days before use. Four samples of ACT were obtained; 25% (1L of ACT in 3L of water, 50% (2L of ACT in 2L of water, 75% (3L of ACT in 1L of water and 100% (Undiluted ACT concentration). the soil was sieved with 5mm aperture iron sieve, sterilized in sterilization chamber at 121^{o}C for 1 hour 30 min and allowed to stay for 2 days before use. The 12 X 16cm polythene pots were filled with the mixture of 2Kg top soil and concentrations into different ratio according to respective treatments. The treatments include:

T1 – 0% Water only- Control

T2 - 10kg of topsoil + 25% ACT

T3 - 20 g of cow dung + 50% ACT

T4 - 30 g of cow dung + 75% ACT

T5 - 40 g of cow dung +100% ACT

T6 - 10 g of Horse dung + 25% ACT

T7 - 20 g of Horse dung + 50% ACT

T8 - 30 g of Horse dung + 75% ACT

T9 - 40 g of Horse dung +100% ACT

Two weeks old seedlings of *A. muricata* were pricked into polythene pots filled with the treatments and watered immediately.

The experiment was monitored for twelve (12) weeks. The following parameters were taken: Plant height (cm) with the aid of a graduated ruler, Stem diameter (mm) with the aid of venier calliper and Number of leaves were taken by counting the leaves on each stand. There were nine treatments replicated seven times making a total of sixty four polythene pots. The experiment was laid down in a Completely Randomized Design (CRD). Data Collection and Analysis. The data were then subjected to one-way analysis of variance to compare the effect of the different treatments on the early growth characteristics of *A. muricata* seedlings. Means were separated using Duncan Multiple Range Test (DMRT) procedure.

Soil Analysis:

TABLE 1: LABORATORY ANALYSIS OF THE SOIL USED FOR THE EXPERIMENT

Parameter	Topsoil
PH (H_2O)	5.54
O.C%	9.53
O.M%	1.86
N%	1.03
%SAND	768
%CLAY	144
%SILT	88
P mg/kg	2.95
Ca (mol/kg)	2.20
Mg (mol/kg)	0.21
Na (mol/kg)	1.67
ECEC (mol/kg)	4.62
Zn	155
K	0.40
Mn	77
Exchangeable Acid	0.14
Texture Class	Sandy Loam

RESULTS AND DISCUSSION:

Results:

TABLE 2: GROWTH PARAMETERS OF *ANNONA MURICATA* AS INFLUENCED BY TREATMENTS ACROSS WAT

WAT	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9
		Plant					Height		
2	5.11± 1.27bcde	7.10± 1.53^{abcd}	8.20± 2.47^{abcd}	7.53± 1.90^{abcd}	7.08± 2.90^{a}	6.00± 2.57^{de}	6.08± 2.57^{de}	6.15± 3.42^{cde}	7.03± 1.52^{bcde}
4	6.06± 1.07^{abcd}	7.40± 1.70^{abc}	9.03± 1.07^{abc}	8.18± 2.29^{abc}	8.02± 1.33^{ab}	7.25± 2.47^{d}	7.00± 2.46^{cd}	7.25± 2.34^{bcd}	7.78± 2.34^{bcd}
6	6.05± 0.05^{abc}	8.21± 0.50^{abc}	9.18± 8.07^{ab}	8.15± 1.93^{ab}	9.18± 2.61^{ab}	8.03± 2.87^{c}	8.08± 1.2^{bc}	7.27± 6.66^{bc}	8.95± 4.16^{bc}
8	7.11± 0.82^{abcd}	9.50± 0.43bcd	10.13± 1.56^{abcd}	9.13± 1.87^{abcd}	9.25± 3.30^{ab}	9.18± 3.87^{d}	9.50± 10.60^{cd}	8.28± 7.31^{bcd}	9.60± 14.61^{bcd}
10	7.21± 0.93^{abc}	9.01± 0.80^{abc}	10.19± 0.70^{abc}	10.00± 1.07^{abc}	11.25± 3.23^{ab}	9.80± 6.10^{abc}	12.70± 11.52^{bc}	8.13± 13.10^{abc}	10.25± 4.13^{bc}
					Plant Stem diameter				
2	2.37± 0.18^{ab}	3.07± 0.35^{ab}	3.14± 0.08^{ab}	3.16± 0.28^{ab}	3.37± 041^{a}	2.18± 0.18^{b}	2.38± 0.26^{ab}	2.46± 0.25^{ab}	2.51± 0.14^{ab}

4	4.24± 0.29^{d}	4.66± 0.52^{bcd}	4.80± 0.45^{bcd}	4.80± 0.45^{bcd}	5.00± 0.56^{a}	3.43± 0.22^{d}	3.96± 0.55^{d}	4.06± 0.21^{d}	4.36± 0.41^{cd}
6	4.98± 1.01^{cd}	5.13± 0.86^{bcd}	5.65± 0.36^{abcd}	5.65± 0.36^{abcd}	6.81± 1.20^{abc}	4.05± 0.15^{d}	5.37± 0.96^{bcd}	5.69± 0.45^{abcd}	5.01± 0.84^{bcd}
8	5.21± 0.82^{b}	5.43± 1.11^{b}	5.43± 0.50^{bc}	5.43± 0.50^{bc}	7.43± 0.89^{ab}	4.76± 1.01^{c}	5.02± o.99^{bc}	5.02± 0.99^{bc}	5.81± 0.36^{bc}
10	5.25± 0.70^{b}	6.06± 0.14^{b}	6.25± 1.11^{b}	6.25± 1.11^{b}	7.57± 1.10^{ab}	5.17± 1.07^{b}	5.17± 1.20^{b}	5.81± 0.36^{bc}	6.00± 0.31^{b}
Leaf production									
2	3.64± 0.40^{b}	3.90± 0.00^{b}	4.01± 0.25^{b}	4.19± 0.00^{b}	4.25± 0.25^{b}	3.75± 0.25^{b}	4.00± 0.00^{b}	4.00± 0.41^{b}	4.25± 0.25^{b}
4	4.75± 0.25^{b}	5.50± 0.29^{ab}	5.75± 0.25^{ab}	6.00± 0.045^{ab}	6.10± 0.41^{ab}	4.75± 0.48^{b}	5.25± 0.25^{ab}	5.25± 0.48^{b}	5.50± 0.65^{ab}
6	5.50± 0.50^{cd}	5.75± 0.25^{bcd}	6.50± 0.29^{abcd}	6.75± 0.0.29^{abcd}	7.00± 0.40^{ab}	5.50± 0.28^{cd}	5.75± 0.48^{bcd}	6.00± 0.58^{abcd}	6.25± 0.25^{abcd}
8	6.50± 0.65^{a}	6.75± 0.48^{a}	7.00± 1.08^{a}	7.00± 1.08^{a}	7.50± 0.29^{a}	6.50± 0.50^{a}	7.00± 0.41^{a}	7.50± 0.29^{a}	7.50± 0.65^{a}
10	7.00± 0.41^{a}	7.75± 0.48^{abcd}	8.50± 0.65^{abcd}	8.50± 0.65^{abcd}	9.00± 0.41^{ab}	7.00± 0.41^{cd}	7.25± 0.75^{bcd}	7.50± 050^{bcd}	7.50± 0.96^{bcd}

WAT = Weeks after Treatment, Mean Values ± S.E followed by the same superscripts in are not significantly different ($p>0.05$) using Duncan Multiple Range Test (DMRT).

Effect of Compost Teas on the Growth Performance of *Annona muricata* (Linn) Seed Lings: The result of Analysis of Variance (ANOVA) **Table 2** showed that there was no significant difference ($p>0.05$) in the effect of different treatments on the height of *A. muricata* seedlings. However, mean values showed that height of the seedlings under compost tea of cow dung at 100% (T_5) gave the highest with 11.25cm while seedlings under compost tea of horse dung at 100% (T_9) gave the lowest height with 10.25cm. There was no significant difference ($p\leq0.05$) in stem diameter of *A. muricata* seedlings. Although there was an increase in stem diameter across the columns but not reflected across the row from week two to ten. Compost tea of cow dung at 100% (T_5) gave the highest diameter with 7.57cm while seedlings under compost tea of horse dung at 100% (T_9) gave the lowest diameter with 6.00cm. And there was no significant difference ($p>0.05$) in the effect of different treatments on the Compost tea of cow dung at 100% (T_5) gave the highest leaf production with 9.00 while seedlings under water only at 0% (T_1) gave the lowest leaf production with 7.00 leaf production of *A. muricata* seedlings.

DISCUSSION: The study, recorded higher in all the parameter growth in all treatments under compost tea of cow dung at 100% fertilized soil than compost tea of horse dung at 100% fertilized soil as clearly indicated in **Table 2**, with statistical differences, this is similar to the result obtained by Wisdom *et. al.*, (2012) who worked on the comparative study of the effect of organic (cow dung) and inorganic fertilizer (NPK) on growth rate of maize. However, Tanimu *et. al.*, (2013), working on the effect of cow and development of maize crop reported that NPK fertilizer soil showed higher growth. Schaffer (1938) working on maize reported that heavy demand on potash (k) is significant in the maintenance of normal physiological functioning of the cell and stem growth. Deficiency of potash he observed results in retarded plant growth. Temperature and pH in cow dung organic manure might invite large number of microbes which obviously facilitates the easier degradation of wastes whereby releasing and enriching soil properties faster than NPK. The leaf number of NPK fertilized soil performed better than cow dung organic manure soil. This may be due to the high percentage of the nutrient (N) needed for grow that this stage. This also agrees with Vignesh *et. al.*, (2012), who reported that nitrogen is a constituent part of element which is found in compost tea manures. Jedidi *et. al.*, (2004), reported that organic fertilizers feed and sustain beneficial microorganisms that live in the soil, while chemical products from NPK often destroy microorganisms due to increasing acid levels in the soil.

CONCLUSION: Use of compost tea to improve plant health, yield and growth by enhancing beneficial microbial communities and their effects on agricultural and forest soils and plants improving mineral nutrient status of plants and inducing the production of plant defense compounds that may have beneficial bioactivities in humans. The results showed that although there were increases in all parameters for 10 weeks in all the treatments but there were no significant difference among the treatments. It is recommended that undiluted compost tea of cow dung should be used to raise *A. muricata* seedlings.

ACKNOWLEDGEMENT: Nil

CONFLICTS OF INTEREST: Nil

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How to cite this article:
Ekaun AA, Abodunrin EK, Williams OA and Geply OA: Comparative effect of compost teas on the growth performance of *Annona muricata* (Linn) seed lings. Int J Pharmacognosy 2023; 10(3): 255-59. doi link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.10(3).255-59.